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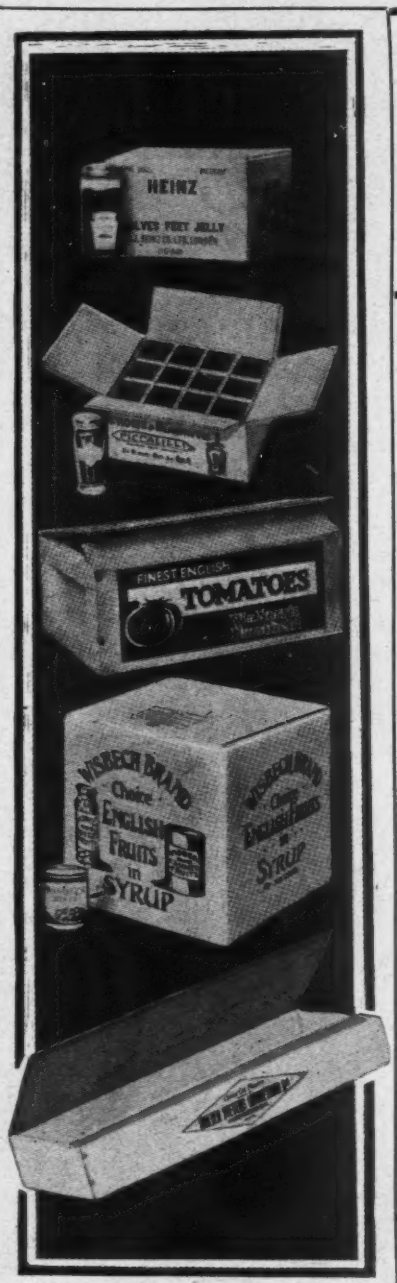

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Food Manufacture

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Vol. I., No. 3

The editor will be glad to consider contributions from those engaged in the Food Industry. Articles intended for publication should be of a practical nature and accompanied by photographs or drawings whenever possible.

July, 1927

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Preservatives.

THE REGULATIONS prohibiting the use of preservatives in the preparation, storage, and distribution of bacon, ham, and egg yolk come into operation on the first day of this month. The same applies to articles of food in which margarine containing preservatives is used. The dusting of bacon with borax has been recently prohibited in Denmark, and in the United States borax is not allowed in bacon sent anywhere within the country.

Boracised eggs have long been an important part of our supply of imported eggs, and as these are liable to be used in cakes consumed by children and invalids, their use is declared illegal. "Boric acid," the Committee declare, "is in our opinion one of the most objectionable substances introduced into food to preserve it."

On and from January 1, 1928, preservatives will no longer be allowed in cream. This measure has given rise to a good deal of dissatisfaction. It has been publicly stated that large numbers of farmers will be jeopardised and that many will be put out of the running so far as the cream trade is concerned. Even threats have been voiced to the effect that people who sell cream will go in for making a synthetic substitute out of skimmed milk and butter, or "milk powder and imported butter." When this matter was raised recently in the House of Commons, the view of the Ministry of Health was that, while there was no power to prevent the manufacture of this product, the existing provisions of the Sale of Foods and Drugs Acts were sufficient to prevent its sale as cream.

In the case of preserved butter, the prohibition has been purposely held up for a year to give ample time to producers in Australia, New Zealand, and Canada to adjust their methods to the new conditions. It has been urged from more than one quarter that a small quantity of sodium benzoate in cream and of sulphur dioxide in butter would materially help the producers and manufacturers, as well as the sellers of these products. In countries like Australia, where butter is made on a large scale, it is held that permission to use a small percentage of non-boracic preservative in cream would ensure its arrival at the central factory in good condition, and the amount left in the butter after washing would be negligible. Evidently, these factories will, in the future, have to exercise strict supervision over all cream supplied to them for butter making by farmers.

Contamination.

Interpretations of the food regulations, words of wisdom on health and diet, and harrowing accounts of food exposed in open shops to the filth of the gutter, have become established features in the daily Press. Clearly, all this portends a complete revision of the methods of storing and handling foodstuffs at present in vogue—a matter which has suffered as much from lack of appreciation on the part of the general public of the true scientific facts, as from lack of scientific investigation and rational control. It is to be hoped that no time will be lost in establishing the necessary machinery for broadcasting unbiassed information and for carrying out the immense amount of scientific research so urgently

needed. It has been decided to found a Chair of Dietetics at the London University; equally necessary is a Chair of Food Hygiene to deal with all the various hygienic problems connected with the manufacture, transport, handling, and storage of foodstuffs.

Wrapped Goods.

One of the outstanding features of the grocery trade in the last quarter of a century has been the development of the sale of goods in packets under proprietary brands. Many articles which a generation ago were sold by the retailer from bulk are now supplied to and distributed by him in packets bearing the guarantee of standard quality, which the name of reputable manufacturers or packers provides.

During the last few years the system has extended to the provision trade. Developments in this direction will go far to overcome the contamination difficulties we have discussed above. There are indications that the public will rely to an increasing degree upon the warranty of quality which a big producer's reputation offers rather than, as in earlier years, upon the skill in selection of commodities by the retailer.

The enormous growth of the trade in cheese in small portions in tinfoil packets which has taken place in the last two or three years is a proof that the public appreciate the cleanliness and the convenience of the waxed cardboard or tinfoil packet; and the development of the practice of displaying provisions, of various kinds, and meats in transparent wrappers which has followed the operation of the Public Health (Meat) Regulations suggests that the activities of the Ministry of Health in the direction of protecting food supplies from contamination by dust and flies will have a wider effect than was anticipated when they were framed two or three years ago.

In the present issue we include an important article on wrapping materials, written by Dr. Serger, a well-known German authority on the subject.

Determination of Sulphur Dioxide in Foods.

Following closely on the heels of the Ministry of Health's Report No. 39, which dealt with the determination of benzoic acid in foods, comes Report No. 43 on the determination of sulphur dioxide. This report, like its predecessor, has been compiled by Dr. G. W. Monier-Williams, and after fully reviewing the literature on the subject, it gives a detailed description of a method of general application which has recently been worked out in the Ministry's laboratory. This method is claimed to permit of an accurate determination of the sulphur dioxide in the distillate by titration, and consists essentially of distillation in a current of carbon dioxide through a reflux condenser into pure neutral hydrogen peroxide, and titration of the sulphuric acid formed. The advantages of this method are that (1) errors due to hydrogen sulphide and volatile organic sulphur compounds are eliminated, the sulphuric acid found being due to sulphur dioxide alone; (2) volatile acids do not pass over into the distillate and interfere with the titration, and (3) it is not necessary to carry out a gravimetric determination, except when very small quantities of sulphur dioxide are in question.

German Marmalade.

In the *Commercial and Industrial Gazette* for April, issued by the Board of Trade and Industries for South Africa, the Hamburg representative of the Commissioner for Commerce reports that the trade with foreign jams has not been satisfactory in Germany. People there eat home-made jams, and used occasionally to buy English orange marmalade. There are now, however, several marmalade factories in Germany, some of which employ British experts, so that importations have become insignificant. Also, the business in foreign canned fruit is not considerable. The German canned fruit is good, and although in 1926 pineapples, peaches, and apricots were imported, the turnover was not big enough to offer good prospects.

Meat Regulations.

Mr. W. G. T. Blois, the able and energetic secretary of the National Federation of Meat Traders' Associations, has compiled an extremely useful Guide to Acts and Regulations affecting the Retail Meat Trade. This booklet of twenty-eight pages gives a clear and concise account of the various legal enactments that concern the purveyor of meat. It is one thing to frame Acts and Regulations, but quite another thing to put them into effective and smooth-running operation. There is no quicker and more satisfactory way of attaining this latter object than by reducing them to a form and by translating them into language readily understandable by the man at whom they are directed.

English Marmalade in U.S.A.

The following is extracted from the *Fruit Products Journal*: "English marmalades are in strong competition with Florida marmalades, much to the dissatisfaction of some of the State's enterprising representatives. Recently the Florida Chamber of Commerce called attention to the fact that two Florida newspapers, the *St. Petersburg News* and the *Clearwater Herald*, carried advertisements of orange marmalades described as being 'direct from England' at 38 cents per pound jar. Commenting editorially on the subject, the *Clearwater Herald* says:

"'If England can make orange marmalade, send it to the United States and sell it at 38 cents a pound jar, Florida ought to be able to make orange marmalade, send it to England, and sell it for ten cents a pound jar. By the same token we should

produce a thousand times more orange marmalade than England can produce. No oranges are raised in England; England gets her oranges from the Mediterranean and from Africa, probably she gets some of them from Florida. Probably we ship oranges over there and she makes marmalade out of them, sends it back, and sells it to us.

"'We should be ashamed of ourselves to permit a condition like this to exist. We should be ashamed that orange marmalade made in England and shipped from England can be put in our shops in competition with our orange marmalade.'".

Food Prices.

In the indices given below for May and earlier months, the prices for individual months are shown as percentages of the averages for the same groups in the year 1924:

INDEX NUMBERS: AVERAGES FOR 1924=100.

Groups.	*May*, 1927.	*April*, 1927.	*Feb.*, 1927.	*Nov.*, 1926.	*Aug.*, 1926.	*May*, 1926.
I. Cereals	96·0	92·3	93·2	97·5	95·0	93·7
II. Meat and Fish ..	86·5	86·1	91·6	99·4	99·2	102·3
III. Other Foods ..	93·2	89·1	90·1	87·1	84·8	89·6
Total Food ..	91·8	89·1	91·6	94·2	92·4	94·8

Exhibitions.

An International Exhibition for the Packing of Milk and Dairy Products is to be held at Berlin from August 16 to 19. United Kingdom firms who may be interested should apply for further particulars to "Verein der Molkereifachleute fur die Provinz Brandenburg," 8, Chausseestrasse, Berlin, N.4.

The Dominions and Colonies have again been invited to form exhibits at the following exhibitions: Advertising, July 18-23; International Grocers', September 17-23; Imperial Fruit, October 28-November 5; Norwich Grocery, November 5-15. The various displays made under this scheme during the past six months have directed widespread attention to the market possibilities of Empire (including Home) grown foodstuffs.

Vitamins.

It has recently been shown that commercial wheat germ, when given as 20 per cent. of the diet, furnishes definite evidence of the presence of vitamin A. Whole wheat, white maize, and oats were all found to be poor in vitamin A, but of the three wheat appears to contain the most. Vitamin A is contained in string beans (the green seed pod) and in green peppers (fruit flesh) in about the same concentration as found in lettuce, more than in cabbage, but considerably less than in spinach, and they are as good sources of vitamin B as lettuce or cabbage, but not so good as spinach. Green peppers contain at least four times as much vitamin C as string beans, and are comparable with the highest that has been reported for any plant material, such as the raw leaf tissue of cabbage or spinach, or the juice of orange or lemon. It is interesting to note that research work has begun at Otago University, New Zealand, on the effect of storage on the vitamin content of butter.

Canadian Fish Research.

Report No. 19 on the Bacteriology of Certain Sea Fish, issued by the National Research Council of Canada, is now available in this country. This report reviews the work done by previous investigators to determine how the bacterial content of fish is affected by various conditions of handling and preservation, and then gives detailed results of the author's investigations on haddock, mackerel, halibut, salmon, and certain other sea fish. The following is a summary of the main conclusions reached:

(1) The flesh of fresh fish is sterile. (2) The gills act as a source of infection. (3) Many bacteria increase with great rapidity in the blood. (4) Fish with alimentary canal full of feed decompose more rapidly than when the tract is empty. (5) More bacteria are found in the ventral than in the dorsal flesh. (6) Slime on fish contains many organisms. (7) Puncturing and damaging fish introduces bacteria and produces more rapid deterioration. (8) Fish kept cool until frozen remain in excellent condition, and the bacteria content keeps low for several months. (9) Large fish beheaded and eviscerated, and then frozen, keep well and have a low bacterial content. (10) Small fish deteriorate more rapidly than large. (11) Halibut caught in the Pacific, frozen and shipped to Montreal, were found in excellent condition with low bacterial content. (12) Mackerel eviscerated and beheaded, and then frozen, keep fairly well, but deteriorate quickly on being thawed. (13) Cooking by boiling or frying reduces the number of bacteria considerably. (14) Boiling or steaming is more effective in reducing the number of bacteria than frying. (15) The relation between number of bacteria, and staleness or other evidences of decomposition, differs with different species of fish. Haddock give a high bacterial count without showing marked signs of decomposition. Mackerel, on the other hand, show a relatively low count and marked degree of deterioration. (16) Many different kinds of bacteria have been identified. (17) Herring and young herring (sardines) contain frequently members of the colon-ærogenes group. (18) Bacteria belonging to the following genera have been identified: *Staphylococcus*, *Pseudomonas*, *Flavobacterium*, *Achromobacter*, *Escherichia*, *Bacillus*, *Serratia*. (19) Sixty-eight organisms have been isolated and identified.

The Bakers' Conference.

Brighton was the scene of the fortieth conference of the National Association of Master Bakers, Confectioners, and Caterers, and about 1,000 attended

throughout the week. The organiser of the Association, Mr. A. Rigsby, in the course of an excellent address, maintained that the altered tastes of the present generation have led to a demand for Vienna bread, which has met with an increased sale. He doubted whether bread containing special ingredients would be regarded as fancy kinds in this country, but he cited the contention of the Australian Courts that Vienna loaves may be classed as "fancy," and weights of 1½ lb. and ¾ lb. are allowable by law. He referred to the popularity of the toasted sandwich in America: the basic idea in that country is that bread is not eaten alone, but always with some other food.

Another matter dealt with was the question of shop closing hours, on which the National Chamber of Trade have made certain recommendations which are embodied in a Bill. One member gave his support to this in moving a resolution. This brought an objection from Alderman Soddy, of Eastbourne, who urged that it would be very unwise for the Association to pledge themselves to support a Bill which has not yet even been tabulated and printed, while Alderman Stephens, of Plymouth, was of the opinion that the Association should support a limitation rather than an extension of hours of the opening of shops.

In the discussion which ensued, it was recalled that in many places in the country vans were considered as shops. For instance, Mr. Heywood told the company that the Wolverhampton Bench has held that view, and fined a trader for delivering after closing hours. The President held that attempts to hold that a van is a shop have failed every time.

Quite the most interesting contribution to the conference was the address of Mr. T. Fletcher, who forty years ago assisted in the formation of the Association. It was his considered opinion that the most serious mistake recorded against the Association's prestige and progress was made last year, when it supported the Government's proposals to bind the trade down to the limited fixed rates for loaves, and that action, he believed, will be severely condemned by a future generation because of its degrading suggestiveness and its retarding influence on the future advancement of the trade. No thoughtful person could affirm that the bread laws were necessary in the conduct of trade, or of any real benefit to the nation, and in his opinion these were the root cause of much underselling and other difficulties. Referring to the publicity campaign to "Eat more bread," in which millers and bakers have guaranteed £10,000, he expressed the wish that all bakers would make the goods more attractive in appearance and as nutritious and appetising as possible. He is opposed entirely to the chemical treatment of flour by millers, since the only excuse for such treatment is that English millers are thereby enabled to compete more successfully with foreigners. He would go so far in this matter as to allow the Association to set their influence sternly and irrevocably against any faking of flour and against, too, any kind of adulterant. His colleagues, he knew, were out to welcome a system of milling whereby a straight run flour is obtained from the choicest wheat, and another straight run flour from a more medium quality of wheat. Dealing with Mr. Fletcher's comments, Mr. J. H. Merrett, of Cardiff, maintained that in order to get untreated flour they had only got to order it, but he believed, nevertheless, that the bread of to-day is of a better quality and more consistent in its output than ever before.

In view of the increasing interest which is being taken in flour as a raw material, we publish in the present issue of FOOD MANUFACTURE an important article by Mr. C. W. Herd.

Forthcoming Articles

Tinplate for the Canning Industry. Dr. Hermann Serger.

Scientific Control in the Chocolate Industry. Dr. H. W. Bywaters.

Manufacture of Fruit Juice Powders. Dr. H. Lüthje.

Our Present Knowledge of Vitamins. R. F. Hunwicke.

Dermatitis. Dr. Drake-Law.

Bacon Curing. Dr. E. H. Callow.

Raw Material of the Bacon Curer. F. W. Jackson.

Dried Milk. N. Evers.

Recent Advances in the American Confectionery Industry.

Citrus Fruit Products. G. T. Shipston.

Baby and Invalid Foods. Dr. E. H. Callow.

Biscuit Manufacture. Robert Whymper.

Jam Manufacture. H. Mansfield.

Fish Curing. Dr. W. E. Gibbs.

Meat Canning. Dr. Lewis.

American Methods of Jam and Pickle Manufacture. Professor Cruess.

A modern South African Canning Factory.

Scientific Control in the Confectionery Industry. R. H. Morgan.

Bakers' Materials. Dr. H. Lüthje.

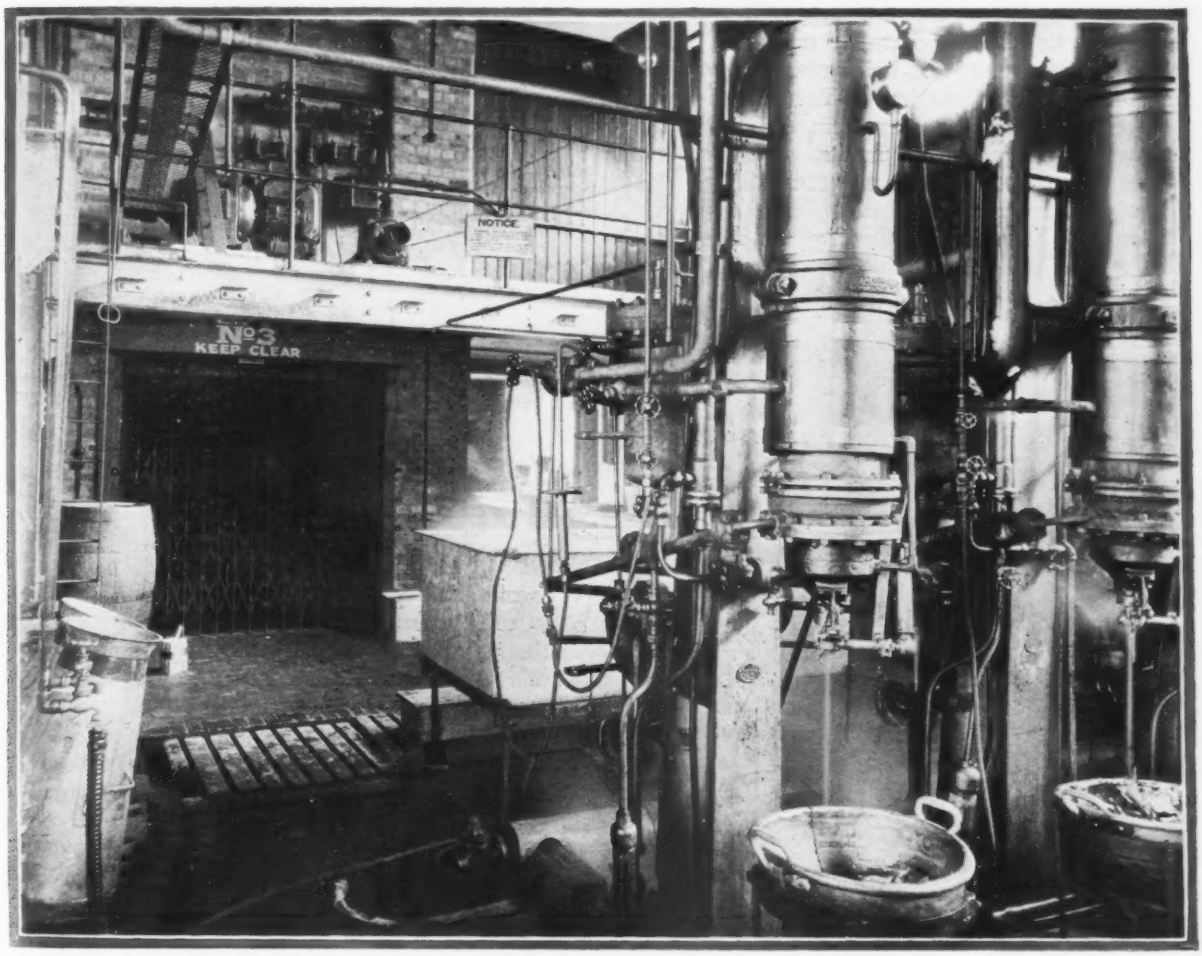
The Utilisation of Cocoa Shells. A. J. Underwood.

High-Boiled Sweets

By R. H. MORGAN, B.Sc., A.I.C.

PART II

The first article of this series dealing with modern sweet manufacture gave a general account of the scientific principles involved, and referred to the extraordinarily rapid development during the past few years in the methods and outlook of the industry. Below, the author discusses the principles underlying the processes of sugar boiling, of "killing the grain," and of hardening, with reference to the preparation of hard-boiled sweets.



View in the Toffee Room at Messrs. J. Lyons & Company's Model Factory at Greenford, showing two of four Cookers and the B. T. H. motor of 15 H.P. operating them. On the same gallery and at right angles to this motor is one of 7½ H.P. which drives two Mixing Pans situated behind the Cookers.

CLASSIFICATION OF sweets by their effect on the teeth more or less divides present-day confectionery into two classes—viz., soft sweets and hard sweets. There are, of course, examples of sweets, such as those with soft centres, which strictly do not come under either heading, but which possess properties belonging to both classes.

An examination of a hard sweet reveals sugar, suitably coloured and flavoured, existing in a hard vitreous state, more or less transparent, and devoid of its natural crystalline structure. These are the high-boiled sweets.

Obviously in this type of confection the sugar is in some kind of supercooled condition, and its hard-

ness implies a very low moisture content. Generally speaking, the hardness of the resulting cold and uncrystallised solid after boiling a sugar solution to different temperatures, depends upon the amount of water left behind—the higher the temperature the harder the solid produced, and *vice versa*.

In high-boiled sweets two essentials must be satisfied—viz., the amount of water present must be extremely small, and the sugars present must be prevented from crystallising.

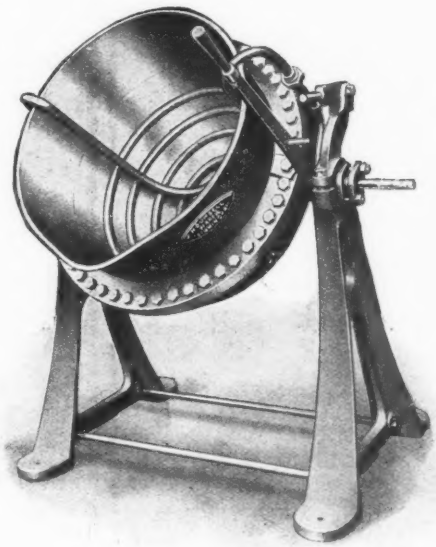
Sugar Boiling

To satisfy the first condition, the solution of sugar, or of sugars, is treated to a comparatively high temperature, ranging anywhere between 280° F. and 320° F. The methods of boiling vary according to the source of heat employed. In the old days an open pan over a coke fire was invariably used. Now, compressed air and gas burners, steam coils, and special vacuum cookers form part of the equipment of the modern factory.

Whatever the method of heating, the object of the sugar boiler is to boil the sugar as rapidly as possible without burning it, and to get rid of as much water as possible.

Gas Heated Boiling Stove.
By courtesy of Messrs. John Hounsell (Engineers), Ltd.

The second essential in the manufacture of high-boiled sweets is that the latter must not contain sugar in a crystalline form. By the time a sugar boiling reaches, say, 300° F., very little water is left in the mixture, and if the syrup was cooled the supersaturated solution would deposit the excess sugar in the form of crystals. To obtain this solution in a supercooled condition by exercising great care in the cooling process may be possible on a laboratory scale, but certainly not in actual works practice.



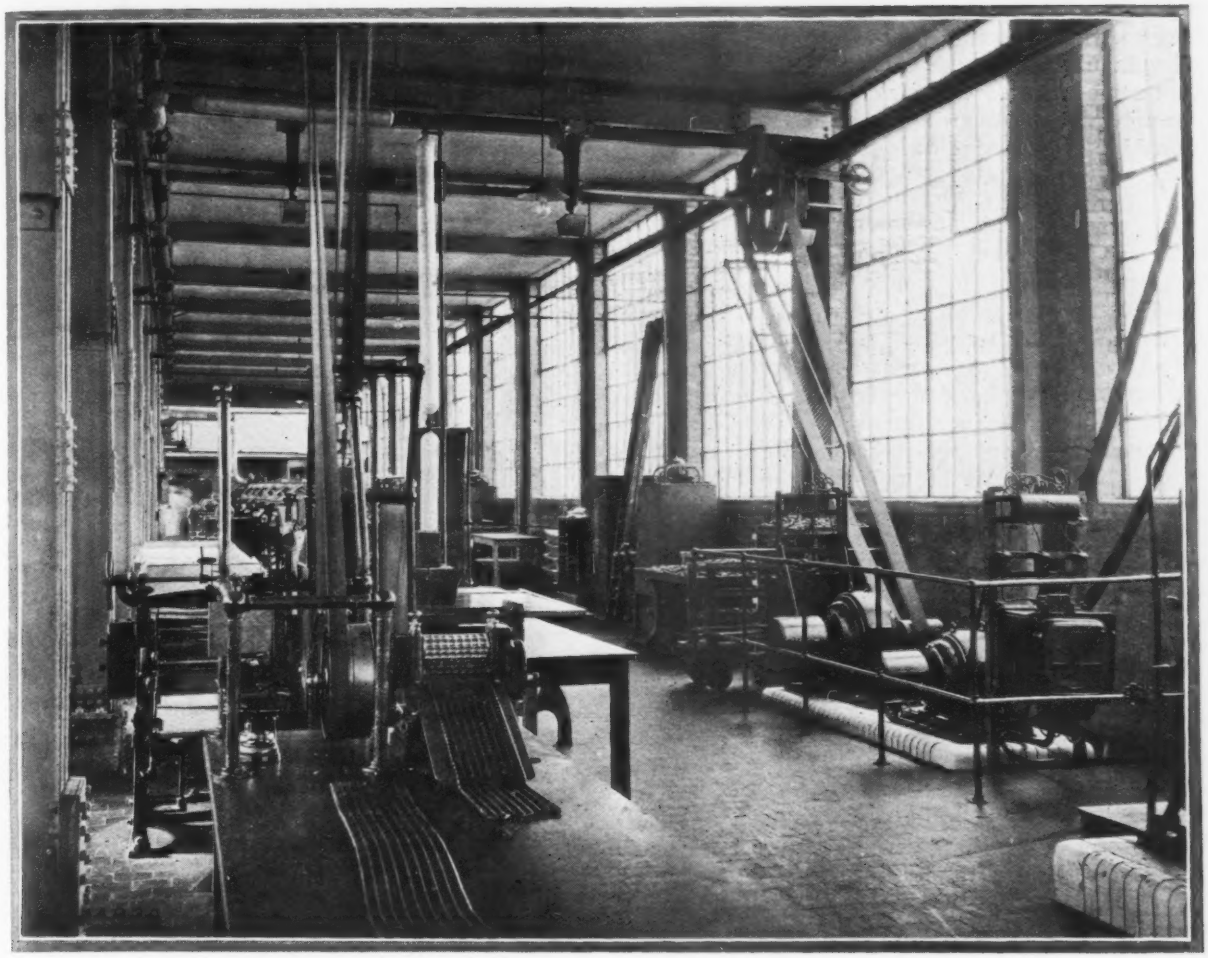
Boiling Pan Using High Pressure Steam.
By courtesy of Messrs. John Hounsell (Engineers), Ltd.

"Killing the Grain" by Acid

It has been found that crystallisation of sugar can be retarded and prevented for some time by the addition of substances of an uncrystallisable nature—*e.g.*, invert sugar. In passing, it might be mentioned that even the presence of certain chemical salts has a considerable effect in this direction, as can be instanced by the production of molasses in a refinery. In the manufacture of confectionery, one method of "killing the grain" (*i.e.*, preventing crystallisation) is to add a substance of an acidic nature to the boiling which causes some of the sugar to become inverted. On cooling the syrup the invert sugar so produced prevents the unaffected sucrose from exhibiting its natural crystalline form.

Great care has to be taken regarding the amount of invert sugar formed in this manner, as the latter is very hygroscopic, and so attracts moisture. Also, invert sugar, if present in large amount, prevents the resulting solid from attaining the required degree of hardness. In order that the inversion process can be controlled as far as possible, a weak acidic substance, such as cream of tartar, is used as the inverting agent, and the quantity added is regulated so as to produce the minimum amount of inversion necessary to "hold" the remaining sucrose in a vitreous state.

It is difficult accurately to control this reaction, because factors, such as time of boiling, etc., greatly influence the result. More consistent results can be



View in the Toffee Room of Messrs. J. Lyons & Company's Confectionery Factory at Greenford, showing two B. T. H. motors and motor starters, of 20 H.P. and 15 H.P. respectively, situated on the right. The larger motor drives three Belhaven Cutters, and the smaller drives two Rolling Machines and a Drop Roller.

obtained by first inverting the necessary amount of sugar by boiling with acid, and afterwards neutralising this, using the invert sugar so formed for boiling purposes.

"Killing the Grain" by Glucose

The acid or tartar method of killing the grain has to a great extent been superseded by a method involving the use of glucose or corn syrup. This uncrystallisable viscous liquid is the result of partly hydrolysing starch obtained from maize or potatoes. Its constituents are dextrin, maltose, and dextrose, with a certain amount of water, and traces of nitrogenous substances and mineral matter. For confectioners' use, glucose syrup is usually bleached by sulphites during the process of manufacture, and, according to the recent Food Regulations, the maximum amount of residual sulphur dioxide is limited to four hundred and fifty parts per million.

In sugar boiling a certain amount of the glucose syrup is added to the ordinary sugar, and its presence prevents the latter from forming crystals. There is no doubt that the dextrins present play a great part in this process and by some kind of colloidal action prevent the sucrose from crystallising. In this case the amount of corn syrup must be limited, as excess gives sweets which become sticky owing to absorption of moisture from the atmosphere.

Time and Temperature

The factors of time and temperature play an important part in the boiling process. Owing to the softening and deliquescent effect of invert sugar, it is necessary to check the production of this form of sugar as far as possible. Acidity of the water used tends to cause a certain amount of inversion, and therefore the time of boiling must be as short as possible. On the other hand, alkalinity, especially at high temperatures, tends to decomposition and disruption of the sugar molecule, producing highly

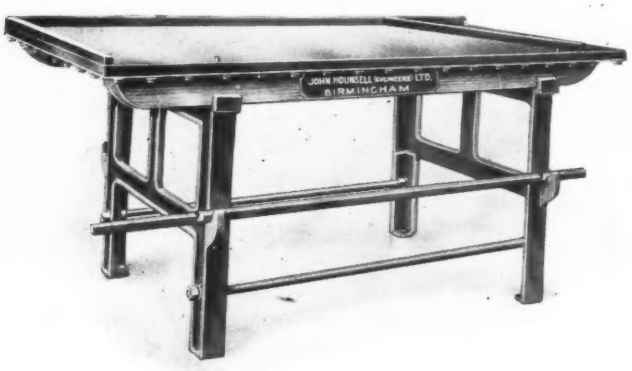
coloured products, with the result that the temperature to which a syrup can be heated is limited. The advantage of a vacuum cooker shows itself here in that a practically dry sugar solid can be obtained in the minimum of time without the necessity of heating to a high temperature owing to the vacuum.

Hardeners

It was found many years ago that sulphites added in small amounts to sugar boilings successfully masked any production of colour by their bleaching action. Afterwards it was also realised that this type of chemical acted as a drier and hardener, in that it considerably reduced the amount of invert sugar formed during the boiling process. While the use of bleaching agents has been definitely prohibited by the Ministry of Health under the new Food Regulations, other substances can be used for hardening purposes. As was mentioned before, both acidity and alkalinity have a detrimental effect on boiling sucrose, and in order to counteract such effects, the hardener must be one which is capable of preventing a great change in the P_H concentration (*i.e.*, degree of acidity) during the boiling. Lime water, washing soda, and the alkali salts of weak acids generally, have been used as driers with varying degrees of success.

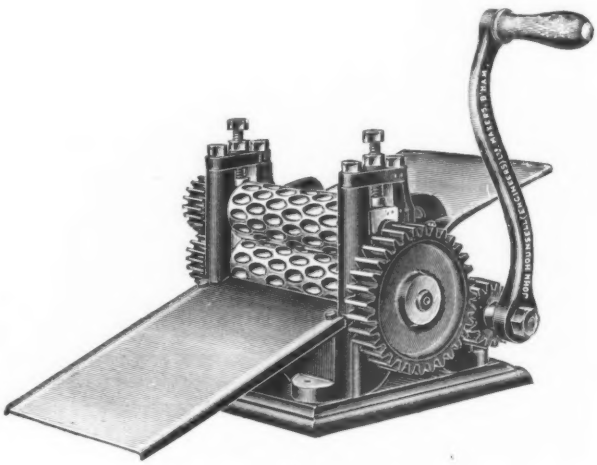
Pouring and Rolling

The form in which the sweet is presented to the public depends on the skill of the sugar boiler. With some types of sweets the flavour and colour are added directly to the syrup in the pan, and the contents poured on to a cool surface. The shapes are then stamped out by metal frames before the syrup has become properly set. In other cases the



Pouring Plate.
By courtesy of Messrs. John Hounsell (Engineers), Ltd.

syrup is poured on to the pouring plate, and, while in a plastic state, suitable colours and flavours worked in. The sugar is then made to assume the shape of a cone, and the thin end gradually pulled out to a tubular form, which is passed through rollers bearing discs, or strips of the plastic sugar



Roller.
By courtesy of Messrs. John Hounsell (Engineers), Ltd.

are placed in presses of varying designs. The illustrations show a common type of pouring table, which can be kept at any desired temperature by means of hot water; and also an example of a roller machine, which can be worked by hand (power, of course, can also be used to work such machines).

A popular type of sweetmeat on the market to-day is the soft centred sweet. In this case the centre of boiled fruit or paste of some kind is surrounded by a high-boiled casing, suitably coloured, and the various shapes are pressed out, as mentioned above.

The approach of summer calls to mind the ever popular seaside rock, which is another example of a high-boiled sweet. The plastic sugar is pulled out, mechanically or by hand, and the name is built up of red strips separated by white ones, the whole forming a stick of wide diameter. This is reduced by pulling out one end, and then cut up into sticks of the requisite length.

Deterioration of Sweets

It has been mentioned that sweets become sticky owing to the presence of invert sugar, and lævulose (or fructose) is the chief cause of this owing to its hygroscopic nature. Also, it was noted that glucose syrup (or invert sugar) prevented sucrose from forming crystals, but this action does not last indefinitely. Unless the sweets are kept in a perfectly dry and air-tight bottle, the natural tendency of sucrose to crystallise will, in time, overcome the restraining influence of the glucose syrup, and, when this crystal formation takes place, the goods are said to be "candied."

Wrapping Materials for Foodstuffs

By Dr. HERMANN SERGER,
Director of the Brunswick Research Station for the Preserving Industries.
(Translated from the German.)

PART I.—PARCHMENT PAPER

One of the results of recent legislation and of the increased interest shown by the public in the question of the purity of foodstuffs, will certainly be a rapid extension in the use of suitable wrapping materials. Information on materials such as parchment paper, cellophane, tin-foil and aluminium-foil, is badly needed. We are fortunate in having secured an article upon this subject, written by the Director of a German Research station. It is a subject to which Dr. Serger has given special attention.

BY PARCHMENT paper is understood, according to the classical works of *Burr*, *Wolff*, and *Berberich*, paper which, after being treated with sulphuric acid or other chemicals, undergoes a change that prevents it from becoming soft and being separated into fibres when soaked or boiled in water. The paper retains its consistency, and becomes impermeable to fluids and to air. When moistened and re-dried, these qualities are not destroyed. The parchmentising of the paper in sulphuric acid takes from three to twelve seconds, after which the paper is thoroughly washed and dried. In order to give it that crisp, grainy quality, the paper is treated with glycerine, dextrose (grape sugar), starch syrup, or laevulose (fruit sugar), and possibly with magnesium chloride as well. Parchment paper absorbs moisture. To overcome this, finely divided elutriated substances, or substances obtained from precipitation, namely, metallic salts such as sulphate of barium, metallic oxides, metallic soaps, or emulsified paraffin, are added to the parchmentising bath and an opaque, non-absorbent parchment paper is obtained. In accordance with the German Patent No. 224699, dated February 6th, 1908, various substances, including parchment paper, can be rendered pliable by soaking the paper in an aqueous solution of invert sugar or fruit sugar to which has been added ammonia or an alkaline salt, such as sodium, calcium, or magnesium chloride, in order to prevent crystallisation. The sugar solution should not contain any sucrose (cane sugar). The faults and other undesirable properties of the paper can be anticipated from this method of production and subsequent treatment.

What is the nature of the faults that may be found in parchment paper, in so far as its use as a material for wrapping butter or margarine is concerned?

Beythien, *Hempel*, and *Borisch* investigated a sample of butter that had an inky odour. This was due to the large content of iron in the parchment paper. *Bartsch* investigated a series of parchment papers and detected magnesium chloride. Magnesium compounds tend to impart a somewhat bitter taste to butter or margarine. *P. Berg* quotes an instance of a parchment paper in which butter had been wrapped showing a red colour in places. It was found that the parchment gave a strongly acid reaction with litmus. The butter had been dyed with a coal-tar substance (an azo dye) which, as observed, reacted to the acid in the parchment paper. Similar discolorations, though possibly not quite so remarkable, were subsequently found by *Berg* on several occasions. Thus, the reaction of parchment paper plays an important part. *Burr* had occasion to elucidate the peculiar faulty flavour of some butter, and finally found that it was due to the parchment paper in which the butter had been wrapped. A strong flavour of turpentine had penetrated the butter to a depth of one millimetre. A glutinous substance, soluble in ether, was extracted from the parchment paper, and it was to the presence of this substance that the alteration in the flavour of the butter was due.

K. Teichert reports that a consignment of parchment paper had been objected to, because products in which it had been wrapped showed signs of a superficial formation of mould. A chemical analysis of the paper proved that sugar was present to a fairly large extent, and a bacteriological analysis demonstrated the presence of numerous spores of mould. Stored in a damp room, a network of filaments had developed from these spores. Butter wrapped in this paper and stored in a fairly damp atmosphere soon showed dark stains which, viewed under a microscope, proved to be a mould growth. Improper storage of the parchment paper in an old shed, as also the sugar content of the paper—thus providing nourishment for germs that had formed on the paper when there was a sufficiency of moisture—were the causes of the unpleasant phenomenon.

Of greatest and most general interest is the question of the content of parchment paper as regards sugar or organic substances soluble in water; also the extent to which paper impregnated with these substances affects the quality and durability of wrapped butter or margarine. *Boltenstern* contended that parchment papers which had been treated with starch syrup could not be held responsible for mouldy butter. *Evers* also attributed any mouldiness in margarine to the margarine itself, and not to the impregnated parchment paper. As against this, however, we have the statements of *Vieth*, *Schaeffer*, *Burr*, *Teichert*, and *Kampen*. *Kampen* tested some twenty different kinds of parchment paper for their suitability as wrappers for butter, and came to the conclusion that papers rich in sugar are detrimental to the durability of the butter, and that those papers

which are produced with the aid of the best glycerine are the most suitable for packing purposes.

Burr, *Wolff*, and *Berberich*, as a result of extensive experiments, obtained noteworthy results which apply primarily to butter, but which can safely be held to apply to margarine as well.

1. Parchment paper under certain conditions affords a foundation for the formation of mildew on wrapped butter.

2. Salty butter, with a nominal content of buttermilk, does not in itself provide a favourable nutritive medium for moulds; when fresh butter containing only 2 per cent. of salt was inoculated with various spores, the latter showed no signs of development.

3. A large content of sugar in the paper favours the growth of moulds on the surface of wrapped butter; this applies also, though to a very much less extent, to a high content of glycerine. Any roughness on the surface of the paper will favour the appearance of mould in so far as the spores can adhere more easily to it.

4. A permanent moisture content is a factor in the growth of moulds. The moisture from the butter dissolves any sugar that may be present in the parchment paper which, in conjunction with the serum constituents of the butter, forms an excellent culture medium. It can, therefore, be readily understood that so-called watery butter, that is to say, butter that contains water which shows in large exuding drops (though the actual water content is mostly normal), is much more prone to form mildew than is butter in which the moisture is as finely distributed as possible.* According to the experiments carried out at the Brunswick Institute, it is more especially during the summer months, from July to September, when the nature of the fodder fed to the cattle favours the production of a watery butter, that the appearance of moulds on butter is observed.

5. Further, access of air is a necessity. If the paper is wrapped very tightly around the butter, a growth of mildew will hardly ensue at spots where the paper adheres closely to the butter.

6. A high proportion of buttermilk, as compared with that of water, favours mould growth.

7. The addition of 2 per cent. of salt (since from one-half to three-fourths of the salt added is retained in the butter, the butter would contain from 1 to 1·5 per cent. of salt) will, generally speaking, prevent the formation of mildew on otherwise normal butter.

8. The behaviour towards the salt content of the butter of the various kinds of moulds is not uniform. The Mucor variety is the most sensitive of all, but there are certain other varieties—the Penicillæ—which are very resistant even to concentrated solutions of salt.

9. Fresh butter, containing no salt, is very open to attack, more particularly by the Mucor varieties. It is important, therefore, that butter intended for shipment and butter that has to be stored for later use should be salted.

10. The treatment of the paper with hot water, followed by a treatment with a cold solution of salt, is an excellent preventative against the formation of mould on butter, and has a mechanical as well as an antiseptic effect.

11. A very strong growth of mildew will appear on salted butter containing the maximum amount of buttermilk, under the favourable conditions mentioned above. This is a growth which appears on unwrapped butter, and is even possible under unfavourable conditions. Fresh butter containing no salt will, provided that moisture is present, mould in any case.

Salty butter, properly prepared, will, generally speaking, not mould when wrapped in parchment paper that contains no sugar. A growth may very readily ensue if the paper contains sugar. In the former case there is scarcely any risk of mould forming in the butter tub, but in the latter instance the risk is very grave indeed. When all the conditions that favour the growth of mould are present, such as paper rich in sugar, dampness, and stagnant air, a growth may eventually appear on thoroughly well-prepared salty butter after the lapse of some time; even though it is not a luxuriant growth, yet it is sufficient to cause discoloration.

(To be continued.)

* See A. Burr, *Ueber die Ursachen des schwankenden Wassergehaltes der Butter*. Molkerei- und Käserei-Zeitung, Liegnitz, Nos. 49 to 53: "The Causes of the Varying Water Content of Butter."

A New Method of Improving Flour

THE Departmental Committee appointed to deal with the question of improving flour, stated in their conclusions and recommendations: "We have been impressed by the evidence which we have received at a late stage in our inquiry in regard to the possibilities of improving flour by physical rather than chemical methods, and by the success which has already attended experiments on these lines on a commercial scale. If improving is necessary, it is in this direction rather than in the use of chemical substances that we should like to see progress made."

At the conference of the National Association of Master Bakers, feeling was expressed against the chemical treatment of flour by millers, and the opinion was expressed that a system of milling would be welcomed whereby a straight run flour is obtained of high standard quality.

Almost coinciding with the expression of these views, a paper was read before the National Association of Millers by Dr. D. W. Kent Jones, in the course of which he described the discovery recently made whereby the baking quality of flour can be improved by a purely physical process. This important discovery, coming as it does at a critical moment in the history of milling and baking, proves that millers have long been striving to improve the quality and strength of flour by means other than chemical. Thus it is now possible to convert flour itself into an improver which, when used in the right proportions, is as potent and effective as the well-known chemical improvers.

Flour as a Raw Material

By C. W. HERD, B.Sc., F.I.C.,
Research Chemist, Messrs. Woodlands, Ltd., Dover.

The article below is of great importance to every user of flour. Bakers, in particular, are very apt to blame the flour for every fault that may appear in the batch of bread. Apart from the unreasonableness of this attitude, there is no reason why, in these days, the bakers' product should not be consistently maintained at any desired standard of excellence, provided he makes himself familiar with the knowledge that has been built up during the past few years concerning the properties of his principal raw material. This article discusses flour from the user's point of view, and gives a simple description of its various characteristics. It shows that the progressive miller of to-day is tending more and more to employ experts in order to unravel the complexities of flour and to wield scientific control over the various stages of manufacture, thus rendering to the baker, and to other consumers, services of inestimable value.

Woodlands' Test Bakery, Dover.

FROM VERY early times, bread has been the staple article of man's food, and to-day its position as the basis of all diets throughout the Western world is unchallengeable. Bread is the baked product, of which the chief constituent is flour, and the characteristics of the flour used in its manufacture are of the greatest importance. The chemical study of flour, bread, and cereal products generally has only been tackled in an organised manner during recent years; previously, there have been isolated pioneers, who have done yeoman work in laying the foundations of cereal chemistry—notably in this country may be mentioned Jago and Wood—but the value of their work was not appreciated as it should have been, owing to the lack of co-ordination. One of the first great efforts to collect and classify the dispersed knowledge on the subject was Jago's *The Chemistry of Wheat, Flour and Bread; and Technology of Bread Making*, which first appeared in 1886. Since that time, the science has grown fairly rapidly, and to-day we find a number of bakeries and mills in this country, and many more in United States of America, employing chemists. With our increasing knowledge and the increasing chemical control in flour manufacture, it is essential for the users of flour to take an interest in and to understand in some measure the

chemical characteristics of the flour they use. Also they should appreciate the effects which the varying properties of their raw material have on the final product. An attempt will be made to outline the various types of flour and their chief characteristics, indicating the important aspects from the consumer's point of view.

Uses

Of the flour manufactured in this country, by far the largest proportion is used in the manufacture of bread, and in view of its great importance, the miller and cereal chemist have given infinitely more consideration to the characteristics of baker's flours than to any other. Pastry flour, which is used for the manufacture of pastry and small goods, is another important class of flour. The biscuit manufacturer, on the other hand, requires quite a different type of material, and flours for this purpose are made on different mills or from other types of wheat than the bread flours. The housewife, again, is a consumer of flour, although in these days the amount thus used is smaller than when the majority of bread was made at home; perhaps the greatest consumption of flour for home use is of the self-raising type, a product which does not require yeast for the production of gas to distend the dough.

Wheat

Only two cereals are used for the preparation of flour for breadmaking and similar purposes—viz., wheat and rye. In this country, the use of rye has practically ceased, and pure wheaten flour is alone on the market, although in Germany and other parts of the Continent rye bread is still the main commodity—with or without an admixture of wheaten flour. As England is very largely an importer of wheat, the miller has a large number of wheats from which to make his selections; wheats from different parts of the world—Canada, United States of America, Russia, Australia, the Argentine, India, etc.—all possess different properties and characteristics, and the miller generally blends two or three different types together, so that the beneficial qualities of each can be incorporated in his flour, or such as are required for the particular trade. The wheats from different sources become available in this country at different times of the year, and it will thus be seen that the English miller has a very difficult task to keep his flour always of the same type and character. Milling is a complicated process, involving many different machines, and the miller frequently makes a "divide"—that is, separates the flour derived from the centre of the grain from that scraped off the bran—again the chance of variation, in the way the different wheats are conditioned and break down during milling, and the possible alteration in the position of the "divide." Thus it will be seen that regularity—so essential in a raw material—is difficult of attainment for the user of flour.

Constituents of Flour

The chief constituents of flour are protein, starch, sugars, water, and enzymes, and on the quantity and quality of each or all of these components depend the characteristics and value of the flour. The first named is, perhaps, of fundamental importance, because it is the proteins present that confer the dough-forming properties, and the nature and behaviour of the dough is controlled by the quality of those proteins. This "quality" of the proteins is now believed to be governed by their physical or colloidal character, and various viscometric methods have been suggested from time to time for the measurement of this colloidal character. The presence of sugars in flour is necessary, for they are the bodies upon which the yeast acts in the preparation of gas during the fermentation; there is, however, not enough sugar present in flour to satisfy the full requirements of the yeast, and it is necessary to have present an enzyme "diastase," which has the power of converting some of the starch into sugar of such a form that is available for the working of the yeast. There are also other enzymes present in flour, which have entirely different powers. For example, proteolytic enzymes, which attack the proteins and convert them into a more soluble form.

Household Flour

To many users, flour is simply flour, but from the above brief outline it will be seen in how many widely divergent ways one sample of flour may vary from another. The household user of flour, for purposes other than bread-making, need not be unduly concerned about either the quantity or quality of the proteins present, as in all flours on the market there will be a sufficiency; neither is the amount of sugar or diastase of importance, because yeast, at any rate usually, is not used. An excess of proteolytic enzymes, however, must not be present, otherwise there will be a tendency for the centre of puddings, etc., to be sticky. In some counties—*e.g.*, Yorkshire, there is still a considerable quantity of bread made by home-baking; in this case yeast is used as the raising ingredient, and a sufficiency of sugar is necessary. In self-raising flour, more important than the characteristic of the flour itself, are the ingredients used for conferring the self-raising properties; the raising power of such flour is obtained by the addition of two harmless chemicals, which, when they are damped, as in making a dough, interact and produce the gas carbon dioxide—*i.e.*, the same gas as is produced by the yeast. One of these chemicals is of an acidic nature, and the other alkaline, and it is essential that after the reaction and the liberation of the carbon dioxide, the residue should be neutral or slightly on the acid side, but not alkaline. If this residue is alkaline, then the goods made will have a yellow colour and an unpleasant taste. The analytical test for this "neutrality" is to shake up the flour with a heavy liquid like carbon tetrachloride in an apparatus with a tap at the bottom (separating funnel); the flour will float to the top and the added chemicals will sink to the bottom, where they can be run off and filtered. A quantity (one gram) of this dry filtered material is then boiled for about five minutes with 50 c.c. distilled water and cooled—the liquid should be neutral, or scientifically speaking, should have an hydrogen ion concentration of PH 7·0.

Woodlands' Laboratory, Dover.

Flour for Biscuits

The biscuit manufacturer again does not require a flour which contains a large quantity of protein, and that protein should not be of too good a "quality." He demands a soft flour, which has a low protein content, such as the flour made from all English wheat or soft Pacific coast wheats.

Baker's Flour: Strength

We must now consider the position of the baker. Some bakers are very apt to blame the flour for any and every fault that appears in a batch of bread; this is not reasonable, for although flour is the chief raw material of the baker, there are others in which variation and faults may occur; notable among these is the yeast. However, in this article we are only concerned with the properties of the flour and the characteristics and standards which the purchaser is entitled to expect. The demands of the bakers, controlled fundamentally, of course, by the actual consumer, depend on many factors, notably the part of the country, the kind of bread made (*i.e.*, tin or cottage), and whether made by hand or machine. Speaking generally, the north of England demands a white flour suitable for tin bread, whereas London and the south of England are more interested in the "strength" of the flour than its extreme whiteness, and more "cottage" bread is made than in the north. The term "strength" demands some explanation. A strong wheat has been defined by the Home Grown Wheat Committee of the National Association of British Millers as one which yields flour capable of making large well-piled loaves: this is more a statement of effect than an actual definition. There are many contributing factors to this conception of the "strength" of a flour, and among bakers themselves there is frequently a difference of opinion as to the order in which a series of flours should be placed. One important factor in the "strength" of a flour is now believed to be closely associated with the "quality" of the protein, and it is well known that a cottage loaf requires a stronger flour than a tin loaf, owing to the supporting help which the sides of the tin give to the dough in the final stages of fermentation and baking.

Regularity

The first attribute that the baker requires in his flour is that of regularity, so that his method of working, once standardised, does not need constant revision. This demand is perfectly justified, and every miller is endeavouring to-day to keep his flour as regular as possible, within the limits possible with his ever-changing wheat blend; with increasing scientific control, the variations of flour despatched from any one mill from day to day are becoming less and less. What are the important characteristics which are required to be regular for satisfactory working in the bakehouse? First of all, the strength; once a buyer has found a flour to suit his particular kind of trade he requires that future deliveries from

the same mill shall be as nearly as possible the same. Many mills and large bakeries find viscometric measurements of great value in estimating and regulating this important factor. Again, when the flour is made into a dough with the yeast it is allowed to ferment, and it is essential that the flour should produce sufficient gas to distend the dough and to leave a surplus of sugar so that dextrination may take place in the oven, with production of crust colour. Variation of this factor will cause trouble; at one time there may be too little gas produced and at another too much "diastatic" action, that is, too much breaking down of the starch. By a simple, quick, chemical estimation, this property can be determined, and any variation rapidly spotted. Then there is the colour of the flour; this naturally varies with the grade, and on placing a repeat order for the same grade of flour, the purchaser expects to get a similarly coloured flour. A method has recently been described of measuring and ascribing a definite numerical figure to the colour of flour, so this is now carefully watched by the scientific miller. Yet another aspect: the baker judges from his experience when the dough is "ripe"—that is, when the fermentation has reached the optimum point and the dough is ready for the oven. It is essential that the fermentation time should be as nearly uniform as possible, and one of the factors influencing it is what is called in chemical parlance "the buffer action," and this is easily estimable, so that its constancy can be watched.

Water Absorption

Another very important characteristic of flour is its water absorption—that is, the amount of water required per sack (280 lbs.) of flour to make a dough of the normal consistency. The more water the flour will carry, the greater is the quantity of bread that will be produced, so that this is an aspect of direct financial concern. The amount of water added to the flour, however, is easily controlled by the baker, and by preliminary trials he is able to determine the water carrying capacity of any flour, and make his dough accordingly. Fluctuations in this property must occur, as it depends on the nature of the wheats available, and at certain periods there is an absence of those wheats which would enhance the water-absorption power of the flour, but the watchful baker is not perturbed by this.

Grade

A very important consideration is the grade of the flour. In these days of over-production in the milling industry, and consequent price cutting, the purchaser must beware. The miller, naturally, wishes to keep his output as high as possible, and frequently disposes of his surplus at a cheap price. Flour is frequently sold under a trade name with no indication of its grade, so that the buyer is completely in the dark as to its character. It is, therefore, advisable that, before accepting a "cut-throat" offer, the baker should insist on knowing the grade of the flour. The grade of flour is determined and controlled by the ash content—that is, the amount of mineral matter it contains. The bran contains more ash than the endosperm, so that the lower grade flour has the higher ash content. An excess of powdered offal—that is, a flour with a high ash content—will render a dough "dead" and sluggish in working and result in a loaf which, when cut, will show a dull, dirty appearance in the crumb. A baker who desires to maintain a first-class trade requires a clean, good grade colour, and should not be tempted to depart from his standard by attractive prices; it may be expensive in the long run.

Flour Treatment

A very controversial question has been that of flour treatment—bleaching and improving—and particularly as to the desirability of the declaration by the miller of any such treatment. Many bakers maintain that such a declaration should be made so that the purchaser may know what he is buying, and the recent report of the Departmental Committee on the Treatment of Flour with Chemical Substances has endorsed that opinion. With the advent of scientific control in the milling and baking industries, it appears to the writer that much mutual benefit could be obtained by a closer co-operation between the two industries, particularly in the question of flour buying and selling.

Scientific Millers

It will be easily realised that the buyer of flour who deals with a scientifically controlled mill has a tremendous advantage over his rival who does not. He can rely on greater regularity in the flour, and can obtain information as to the characteristics and properties of the product. Further, if he has any difficulties he can apply to the mill laboratory for assistance or advice. Many large buyers have their own laboratories, and it is urged that greater satisfaction would be obtained by both buyer and seller from the co-operation and inter-liaison of the two laboratories.

(Continued from next page.)

India and China. This method of inflation has arisen both owing to poverty or the lack of funds to purchase the more suitable foods and to ignorance resulting from existing low standards of education and living. I know nothing so temporarily and explosively filling as two bowls of rice washed down with highly aerated lemonade. Yet the fact that this is a common method of obtaining a sense of repletion illustrates the mentality of the Japanese generally, and shows an overweening desire to deceive themselves and others into believing that they are in every way better off than they really are.

The slow introduction of Western standards is making rapid changes in the time-honoured diet of the people. And as these changes occur we shall see such far-reaching communal progress (or retrogression, according to the point of view) as emancipation of the women from sexual slavery, a freedom from the ties of family bondage, and a stronger race of people more fit to cope with the exigent needs of modern civilisation.

Food and Fortune

By ROBERT WHYMPER

PART II.—JAPAN

The author continues his deliberations on the psychology of mankind in relation to diet. The present article draws an interesting picture of the Japanese as seen through the eyes of one who has studied dietetic habits in many lands.

IN SPITE of the care and expense lavished in developing my palate, I found that I was considered "small beer" among the Japanese for not being able to distinguish readily the (to me) subtle difference of flavour existing between Japanese and Rangoon rice. The simplest peasant could put me to shame by picking out, at once, his native rice from a number of samples, and, notwithstanding his poverty, he will readily pay the higher price for the home-grown grain because, according to his taste, it is more fatty and palatable. For a long time to me rice was just rice, a singularly insipid cereal, but with patience and practice I was eventually able to raise myself in the estimation of the Japanese at the cost of a future everlasting distaste for "gohan." Nor was I at first ready to wax enthusiastic over the flavour of raw, live carp, cut in thin slices so delicately that the fish at the time did not seem to resent dissection, though, had not the precaution been taken to place paper discs over its eyes, it might well have landed in my lap at the moment of serving, so alive and active was it. Even to my last day in Japan I had to ask my attendant "geisha" to remove my slice from the quivering body with her chop-sticks whilst I turned my eyes away from the revolting sight. The eating of live fish is also common among the fishermen, who think that the "iwashi" (to all intents and purposes our "sardine," but when so called commanding a higher price as a Western delicacy) is only worth eating when caught by the tail and swallowed alive and kicking. But those who gasp at such cruel and primitive tastes would do well to remember that we in the West eat with much relish (at about 5s. per dozen) the raw, but succulent, oyster that is scarcely dead. Such examples of feeding on living creatures may indicate a tendency to cruelty towards animals other than human. And it is, indeed, a fact that the Japanese are cruel by nature to the animals made to serve them, to their horses and cattle as well as to fish, though it must be placed to their credit that they carry cruelty to their own kind also. It may be said generally that the Oriental is Stoic in suffering and Spartan in inflicting pain. It is probably for this reason that his mental attitude towards other living things is at first sight despicable in our eyes, since we know that it is not the teaching of their religious creeds, which, above all, demand kindness to dumb creatures.

Among the Japanese there are, however, other aspects than cruelty in their mode of feeding. For nearly two years I successfully avoided sitting down to a meal of "globe fish," which carries in its eyes and certain other portions of its anatomy a poison deadly to man. My life insurance was, and is, small, and I had grave doubts whether, after eating a soup (which the insurance company might justly claim to be a poisonous concoction in case of my death) wilfully and with full knowledge on my part that it contained "globe fish," I should escape the "suicide" clause. And I have a wife dependent upon me. It was no consolation that it could not be claimed that the "hand of God" had taken part with the cooks that spoiled the broth. But eventually I was forced by a yellow hand to face the peril, and I survived after suitable prayers had been offered up to my patron saint. Here, then, is an example of physical courage—or, if you prefer it, an indifference to life for the sake of a momentary satisfaction. Somewhat the same indifference to life can be seen among the Japanese in other examples of their behaviour, as, for instance, in their indulgence in suicide for reasons quite insufficient in our eyes. The Japanese, like most Orientals, are fatalists and, like all fatalists, are prone to fanaticism where throwing away their lives is concerned. The fanatic tendency can be seen in their attitude to the Emperor, whose honour they are prepared to uphold and whose land they will defend with the utmost disregard for their own persons, not by compulsion or legislation, but by a belief in the justice of their cause in defending with their life's blood the earthly embodiment of the creative and tutelary deities of their country. The several instances of "hara-kiri," or disembowelling at the time of passing the United States' immigration law, levelled particularly against the Japanese, are cases in point where protest was made against an implied slight to their nation by suicide.

Rice and beans (lentils and soya) with some fish, vegetables grown on land heavily manured with night-soil, and seaweed are still the staple articles of food of the majority of Japanese—a meal that blows out the stomach, gives a false sense of repletion, and is soon worn off by physical labour. It is small wonder that the Japanese suffer so frequently from intestinal complaints or that they are mostly undernourished. It is true that we have heard much of the wiry Japanese soldier, and, in fact, since his army ration has been improved his resistance to fatigue has been greatly increased. But all the instances of remarkable staying-power that I have examined can be laid to fanaticism which thrives upon just such a diet as was and still is most common among the people.

Again, the desire to secure a sense of fullness rather than to be filled with proper, nourishing food can be seen in the Japanese love of highly gaseous, sweet beverages, equally popular with their brethren of

(*Continued on previous page.*)

The Herring Industry

By W. E. GIBBS, D.Sc., F.I.C.,
Director of the Research Department, The Salt Union, Ltd. Author of "The Fishing Industry"

That the Herring Industry can claim to be reckoned amongst the more important provisioners of the Nation is evident from the fact that the annual catch of herrings round our coasts amounts to nearly 400,000 tons. The article below describes the fishing methods employed, and discusses the differences in appearance, quality, and food value of the fish according to differences in species, feeding ground, and season at which it is caught. In a forthcoming article the author will deal with salting and smoking processes for preparation of salt herrings, boaters, and kippers.

PART I

Landing Herrings.

THE HERRING is undoubtedly the most important food fish caught off our shores. It possesses a higher food value in calories per pound than that of any other fish. Its flesh contains up to 30 per cent. of oil that is rich in vitamin A. Whether consumed in a fresh condition, or after being converted by salting or smoking into a salt herring, a bloater, or a kipper, the herring possesses a definite and characteristic flavour that is directly due to its content of oil. The flesh of white fish—for example, the cod or the haddock—contains no oil and is relatively insipid. In such fish the oil is always present in the liver.

The herring is very prolific, a single female of average size producing in the spawning season between 20,000 and 47,000 eggs. The British annual catch of herrings averages nearly 400,000 tons, and is worth about £5,000,000. No other kind of fish is caught in such large quantities.

Pelagic and Demersal Fishes

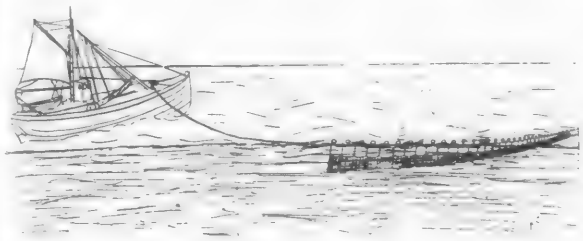
Sea fishes may be divided into two classes: The "pelagic" fishes, that inhabit the surface waters, such as the herring, mackerel, tunny, flying fish, many sharks, and also various marine mammals, such as whales, grampuses, porpoises, dolphins; and the "demersal" fishes, that live at the bottom of the sea—for example, the cod, haddock, plaice, and sole.

Food of Fishes

The surface water of the sea abounds in minute forms of vegetable and animal life. This vast floating

population of microscopic organisms is called the "plankton." Various minute crustacea, known as "copepoda" (literally, oar-footed), spend the whole of their lives drifting about in the surface water. They occur in incredibly large numbers. At certain times of the year—notably, in spring and summer—the plankton contains also the eggs and larvæ of many species of fish and of crustacea and mollusca.

Pelagic fish—*e.g.*, herring and mackerel—feed almost entirely upon the larger plankton—mainly, copepoda. Shoals of herring or mackerel probably follow certain swarms of copepoda. Pelagic fish obtain their food almost automatically as they swim open-mouthed through the water in which it abounds.



Drift Net in Use.

These direct plankton-feeders possess comb-like structures, the gill rakers, attached behind the gill openings, which, as the food-bearing water streams through the mouth and gill openings, strain the food from it. The fish licks the plankton from its gill rakers and swallows it.

Demersal fish, with a few notable exceptions, feed upon smaller fish. They seek their food by scent and touch.

Fishing Methods

Pelagic fish—for example, the herring—are caught with drift nets. A drift net is a completely submerged, vertical curtain of netting, one end of which is attached to a boat called the "drifter." The net is allowed to drift with the tide, and extends in a straight line from the boat for as much as three miles. The fish swim against the net, thrust their heads through, and then, owing to their gill openings, they are unable to withdraw and so become entangled. Unlike the trawl net, the drift net generally catches one kind of fish only, either herring or mackerel, drift-net fishing being carried on at a time when these fish come together in shoals at the surface for the purpose of spawning.

Demersal fish are caught by trawling. A trawl net is essentially a large string bag which is drawn open-mouthed along the bottom of the sea, scooping up wholesale all the bottom-living fish, such as cod, haddock, sole, and plaice, both large and small, mature and immature.

The Herring

With the exception of the mackerel, the important edible pelagic fishes belong to the herring family. They include the herring, the sprat, the pilchard, and the brisling. "Skipper sardines" are young herring, pilchard, and brisling.

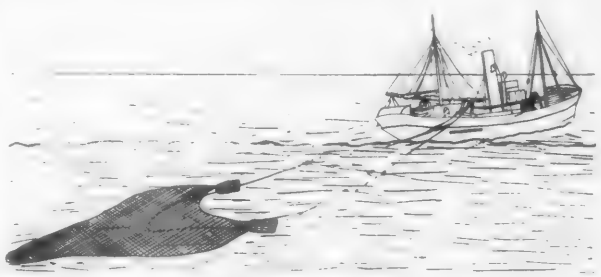
The herring abounds in the waters round the coast of Great Britain. There appears to be a series of local races or species at different points round the coast. Each local race appears to spawn at a constant time of the year, but the date of the annual spawning, and, hence, the herring fishing season varies from point to point. Fishing begins in the middle of May, off the west coast of Scotland, its chief centre being Stornoway. In early June, it has passed on to the waters round the Orkneys and the Shetlands, and then, in succession to Wick, Fraserburgh, Peterhead, and the Northumberland coast. By the middle of July it has reached Blyth and Shields, and, towards the end of July, Scarborough and Grimsby. The season opens at Yarmouth and Lowestoft early in October. The last herrings to be caught in British waters are caught round Devon and Cornwall in December.

Fluctuation in Food Value

Generally speaking, all marine fishes annually pass through a well-marked series of seasonal changes. These changes are directly connected with the development of roe and milt, with the fluctuation of the percentage of oil and fat in the liver and body tissues, and also with the rate of growth. Consequently, the chemical composition of the fish, and, hence, its food value, varies greatly according to the season at which it is caught. The gradual change in the composition and food value (in calories per pound) of the herring, as spawning time approaches, is well shown in Table I.

Herrings are caught when they assemble in shoals for the purpose of spawning. They are thus most easily caught at the time when their food value is at a maximum. The flesh of herrings, unlike that of demersal fish, contains a quantity of oil disseminated throughout the flesh in the form of fine globules. From the above table, it will be seen that the percentage of oil in the flesh of the herring may be as low as 2·5 in May, and as much as 31·5 in August.

Herrings caught at different places show well-marked differences in appearances and quality, which are evidently due to differences in species and feeding ground. The food value of the herring depends, also,

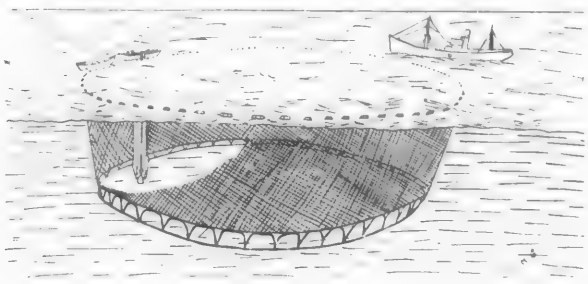


Trawl Net in Use.

upon the time of the year at which spawning occurs. In the Irish Sea, there are two races of herrings, the Manx and the Welsh. The Manx herrings spawn in the summer, and are rich in fat. The Welsh spawn

in the winter and are poor in fat. Of the various kinds of herring obtained at different places, the largest and finest fish are those caught at Downings Bay, off the north coast of Ireland, Castle Bay, off the Island of Barra in the South Hebrides, and off the Shetlands.

Herrings differ very much in their suitability for handling, keeping, and curing. Most herrings have a small gut, which is easily removed without seriously damaging the body of the fish. Blyth and Shields herrings, however, are very rich in fat and have a special big, distended gut. Such herrings are difficult to clean, because, when this large gut is removed the



Purse Seine, before Pursing.

belly of the fish is so tender that it is often broken. The Yarmouth herring is firm and hard; it is best adapted for handling and curing.

Fishing Operations

The boats from the various fishing ports work round the coast, following the fishing from port to port. At Yarmouth, for example, during the herring season, there are over a thousand drifters from nearly all the fishing ports round the coast. Each boat carries from seventy to eighty nets, of approximately one-inch mesh. The upper edge of a net is about fifty-five yards long, and is buoyed up by about eighty large corks, distributed equidistantly along it from end to end. The net hangs with its upper edge about two fathoms below the surface water, the lower edge being about three fathoms below. When fishing, the boat takes up a position stern on to the tide; the nets are paid out over the bow and connected up in line, and are carried by the tide till they form one long line, one end of which is attached to the drifter. The position of the nets is indicated by a line of bladder floats.

Generally, the fishing goes on all night. In the morning the nets are hauled in and, together with the attached fish, are thrown into the hold situated amidships. The drifters then return with all possible speed to the fishing wharf. Meanwhile, the men draw the nets from the hold and shake them free from any entangled fish.

Of recent years, herrings have been caught to an increasing extent with seine nets. The seine net may be described as a drift net provided with a draw line passing through rings that are attached to its lower edge. The net is paid out from two small boats to form a closed circle surrounding the fish. The draw line is then drawn tight, and the net becomes converted into a bag or purse containing the fish. The catch is transferred to the hold of the ship, and the net is shot again.

When the vessel reaches the port, the fish are unloaded in a round basket, which is stamped by the Fishery Board officer as holding a quarter of a cran. A cran averages from nine hundred to a thousand herrings, and weighs approximately three hundredweights. A good day's catch would consist of about ninety crans—that is, would average about a hundred thousand herrings and would weigh about thirteen tons. Some boats come in with as many as a hundred and fifty crans of fish, and the total catch on a good day may exceed thirty thousand crans, weighing about four thousand tons.

Sometimes, when a catch has been poor, the drifters remain out on the fishing grounds for another day rather than come home with a small catch. In this case the two catches are kept separate, the first catch being called "overdays." Overdays are worth about half the price of fresh fish, and are, of course, less suitable for high-grade curing.

After it has been purchased by the curer, the fresh herring may develop into a salted herring, a red herring, a bloater, or a kipper, depending upon the degree of salting and smoking to which it is subjected. Herrings are sometimes put into cold storage, to be withdrawn subsequently, as occasion demands, either to be salted or, more frequently, to be consumed fresh. Cold storage affords a convenient method of preserving herrings when there is a glut, for at such times it is often impossible to deal with the herrings adequately in the ordinary curing yards.

TABLE I

MANX SUMMER HERRINGS, 1916

COMPOSITION OF THE FLESH OF THE FISH. MONTHLY MEANS

Date.	Condition.	Water.	Oil and Fat.	Proteid.	Ash.	Total.	Food Value
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Cals. per lb.
May	Empty.	75·0	2·5	21·1	2·3	100·9	1,100
June	Filling.	66·1	11·4	18·6	2·0	98·1	1,806
July	Filling.	55·8	21·6	18·4	2·3	98·1	2,762
Aug.	Half Full.	48·4	31·5	16·5	2·3	98·7	3,608
Sept.	Full.	51·9	25·2	17·3	2·6	97·0	3,059

(To be continued.)

Trade Inquiries

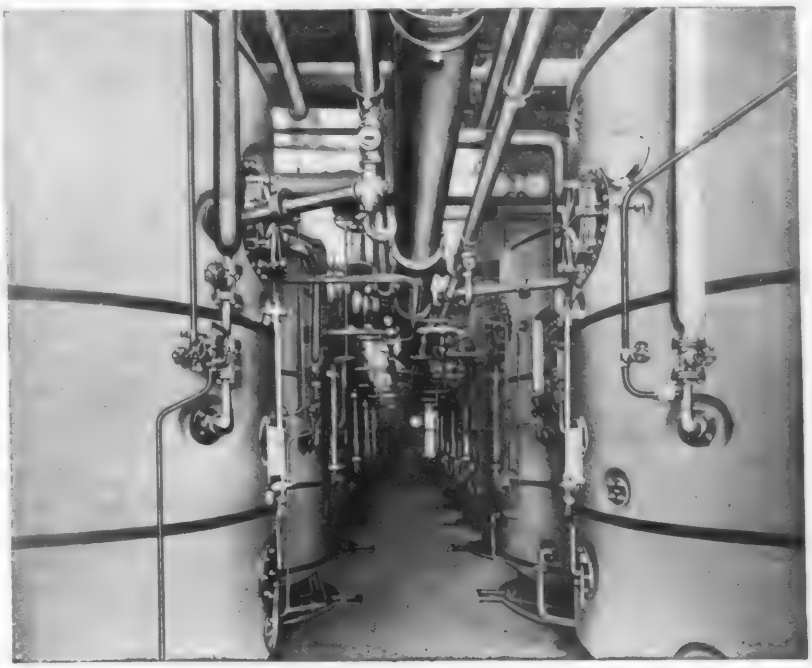
WE have received inquiries for the names of firms making machines for bottling sweets and pastes under vacuum, and machines for shredding coconut for manufacture of desiccated coconut; also for plant for preparation of salt crystals.

The Manufacture of Margarine

By P. S. ARUP, M.Sc., F.I.C.
Formerly Chief Chemist to English Margarine Works (1919) Ltd.

PART I.—THE RAW MATERIALS

Below is the first of a series of articles dealing with the manufacture of margarine. This article discusses the raw materials employed in the industry; the characteristics of the various kinds of fats and fat mixtures, the control of cleanliness of the milk, the methods of using starters, and various questions arising out of the use of milk powders and colouring matters, are all treated in considerable detail.



A Battery of Deodorisers.
By the courtesy of W. J. Fraser and Co., Ltd.

THE MANUFACTURE of margarine may be considered under the following four main headings: (1) The preparation of the raw materials. (2) The mixing or churning process. (3) The cooling of the emulsion formed by churning. (4) The after treatment of the cooled emulsion.

Fats

As in all processes of food manufacture, the fats and oils used for margarine making must be checked by smell and taste; at all events, if one wants to make a high-class margarine it is absolutely necessary to use the best raw materials, and there is no mysterious process of "faking" which will turn bad materials into good margarine. Judging by smell and taste can, of course, only be learnt by actual experience and prolonged practice, and there is no laboratory method of testing which can take its place. Laboratory methods are in the main useful chiefly for detecting the reasons for faults in the fats or oils, whether, for example, they may be due to excess of free fatty acids or to admixture with foreign oils or fats or extraneous material.

Of the substances which spoil the taste of oils and fats, causing the various forms of rancidity, the only ones which can be detected and estimated by chemical means with any degree of satisfaction are the free fatty acids. These are most objectionable in the kernel fats—*i.e.*, coconut and palm kernel oils and allied products, as they are more volatile and thus affect the taste and smell to a far greater degree than do the free fatty acids formed in the animal fats or in ground nut or cotton oils. Thus kernel fats should not contain over 0·15 per cent. of free acids, while in animal fats as much as 0·5 per cent. may not be objectionable. It must always be remembered that a fat may be quite rancid, and yet show a satisfactorily low percentage of free acids.

Fat Mixtures

As regards the choice of fat mixtures, the best brands of margarine are made of the animal fats, beef oleo and lard, without the addition of vegetable oils or fats other than the necessary quantities of the liquid oils, ground nut or cotton oils, to give the required consistency. Hardened or hydrogenated oils may also be used, though they must be applied with discretion, and much depends on their consistency and general quality. The cheaper makes of margarine are blends of the kernel fats and the liquid oils; these blends do not possess the same butter-like texture and consistency as the animal fat blends; in admixture with the animal blends they yield margarines of intermediate grades. The proportions of solid fats to liquid oils is naturally varied according to the climatic conditions; in the case of the purely vegetable qualities containing only palm kernel, and (or) coconut oil and liquid oils, the percentage of the latter will generally be found to vary from about 15 to 30 per cent., while in the animal margarines the corresponding variations are often much larger from summer to winter.

Vegetable Fats

Although, as just remarked, the kernel fats do not enter into the composition of the highest grade margarines, yet it must be said that their extensive adoption in margarine making, which took place about the beginning of the present century, was an innovation almost equal in importance to the invention of margarine itself, for by this means vast new resources of fatty food material were brought within reach of the great populations of Western Europe. A vegetable fat which would be ideal for margarine making, because it comes considerably nearer to butter fats as regards consistency than the kernel fats, is palm oil, the oil (or, more strictly speaking, fat) which is obtained from the palm fruit. Unfortunately, there are great difficulties in the way of obtaining this product in an edible form, for the fat rapidly deteriorates in the picked fruit before extraction to such an extent that no amount of refining will get rid of the taints of smell and taste. In the case of palm kernels, copra, or cotton seeds the material can be kept for some time before extracting, and the respective fats can be refined by the usual process of neutralising the free fatty acids with soda, separating off the resulting soap solution and attendant impurities, and finally blowing the fat with steam in vacuo in order to remove the volatile matter which causes taints in smell and taste.

Milk

The separated milk, which is the other main raw material for margarine making, is best obtained by separating at the margarine factory whole milk obtained direct from the farmers. In some factories the separated milk is obtained from large dairies, in which case it will eventually undergo two pasteurisations, one at the separating dairy, and one in the dairy of the margarine factory. It is also an advantage to be able to examine the original churns of milk as they arrive from the farms, rejecting any that do not come up to standard as regards smell and taste. The various suppliers' milks may also be tested by the reductase and fermenting test, as is done in many of the Danish co-operative creameries. From the average results of this test taken over a period, one may form a very fair idea of the degree of cleanliness prevailing at the different farms. The degree of acidity is, of course, also a useful datum, especially as it is so quickly determined, but it must always be remembered that a milk may be thoroughly bad without showing any unduly high acidity.

Starters

Cleanliness in the treatment of the milk is, of course, a very important factor as affecting the keeping properties of the finished margarine, and the same also applies to the preparation of the lactic acid cultures used for the ripening of the separated milk. A number of dairy laboratories on the Continent, especially in Denmark, prepare excellent starters, which are to be cultivated in separated milk under certain conditions; the particular brand adopted will be very largely a matter of individual preference, and may be influenced to some extent by local conditions. The starters are to be propagated in good, freshly pasteurised, and cooled separated milk, under conditions excluding infection. A good temperature to employ is about 68° F., in which case the cultures will be ripe—*i.e.*, have attained the required degree of acidity which is just decinormal or slightly under (corresponding to about 0·09 per cent. of lactic acid)—in something under twenty-four hours. Somewhat higher temperatures have been employed, and may also be used when souring the actual milk used in the margarine, but it should be remembered that the higher the temperature the greater the danger of infection by yeasts (torulæ), an evil which is especially to be avoided. For the same reason, the starters or soured milk must never be allowed to become overripe, but should be well cooled as soon as the specified degree of acidity has been reached. If a particular culture is found to be abnormally slow in reaching the usual acidity, or develops taints of smell or taste, it should be discarded, at any rate, for the time being. It is good policy to keep a proper bacteriological control of the souring process in all its stages, to ensure that the starters and soured milk shall contain only the lactic acid organisms of the required type, and especially to ensure the absence of yeasts and moulds at this most important stage, since these organisms are the most frequent causes of the finished margarine failing to keep as long as it should. The starters, or basic cultures, may be cultivated in anything from a quart to a gallon of milk, according to individual preference and arrangements; the intermediate souring may be in, say, 40 to 100 gallons, the latter being then in its turn used for inoculating the milk to be used in the process. For the starters, about one per cent. of culture may be used for inoculation, and in the later stages with larger quantities of milk, up to five or even ten per cent. may be used. Danger of infection naturally increases with increasing quantities of milk treated, and this may be counteracted to some extent by increasing the amounts used of the soured milk for propagation. This procedure, of course, also shortens the time of ripening

which may be an advantage in some cases, and is a better means of achieving this object than the practice of raising the souring temperature.

Milk Powders

A word or two may also be said concerning the use of milk powders instead of natural milk. Under certain conditions of emergency this practice has obvious advantages, but it should be avoided wherever possible, for, generally speaking, it is not conducive to the best flavour in the finished margarine. If used, the milk powder of a fine floury texture, made by the spray process, is very useful, since the product, when made up with water, keeps homogeneous. On the other hand, the artificial milk made from the more flaky milk powder, which has been dried by the roller (Just Hatmaker) process, separates out flocks of protein on standing for a comparatively short time. Unlike the whole milk powder made by the spray process, the separated milk powder keeps quite satisfactorily, provided that it has been made under proper conditions from efficiently skimmed milk in which the proportion of fat has been reduced to a minimum.

Proportion of Milk to Fat

The amount of milk used may vary from about fifteen to somewhat over fifty per cent. of the fat. Some unsalted or very lightly salted qualities (fresh) are made by simply churning the fat mixture with water, but by far the greater proportion of margarine made is churned with milk, the smaller proportion mentioned above being used for the cheaper vegetable qualities, and the larger proportions for animal qualities. The butter-like flavour increases with the amount of milk used; during the churning and subsequent period, the flavour of the ripened milk is taken up by the fat, after which the excess of the milk must be removed so as to reduce the water percentage of the margarine to within certain limits.

Colour

As artificial colour is added just before or during the churning, it may be considered at this point when the main ingredients—*i.e.*, the fat blend and the ripened milk—are ready to be mixed by churning. The colours almost exclusively used are certain coal tar products classed as azo colours, the vegetable anatto frequently used for colouring butter being unsatisfactory, since it tends to give a pinkish colour in margarine and has not the strength and constancy in composition of the coal tar colours. Some coal tar colours proposed for use in margarine are very sensitive to acid, being turned pink thereby, and they may be affected even by the weak lactic acid in the margarine. It is, therefore, best to test all colours by diluting with oil to approximately the strength used in the fat mixture, and shaking a little in a test tube with ten per cent. sulphuric acid; if, on standing, the lower acid layer has turned red or pink, the colour should be rejected. The colour should also be tested for fastness to light, by exposing a small portion of margarine made with it to light for several days, keeping a portion of the sample covered with black paper for comparison; the sample should be placed close to a window, but exposure to sunlight must be avoided. After a few days there should be at the most a slight fading, but no bleaching or change of colour to a pinker shade, such as occurs with many colours. It is, of course, useful to compare several brands of colours simultaneously in this manner, and select the best. The margarine manufacturer may prepare his own colour, if so desired, by dissolving the dry colour in a liquid oil in a steam-jacketed fat-melting vessel, stirring and heating with steam. Preliminary experiments will show the proportion of any colour that can be used in the oil, and it must here be remembered that a solution may remain unaltered when kept overnight at a low temperature, but may deposit colour in crystals if kept at the same temperature over a more prolonged period—say, a month or two.

(*Continued from page 77.*)

factories would be necessary to produce only one-quarter of the sugar consumed here. The factories which were first built had to face the difficulty of obtaining adequate supplies of beet from the farmers, but this difficulty no longer exists. On the contrary, there is now a demand for factories from the farmers, and the expansion of the industry is at present hindered chiefly by the reluctance of capital to invest in the industry. This reluctance is due partly to an insufficient knowledge of the possibilities of the industry and partly to the opposition of the refining interests. The experience already gained shows that an efficient sugar factory is a profitable investment for capital, even if the subsidy period alone is considered. The successful results of existing factories has done, and will do, much to convince the doubtful ones of the possibilities of the new industry.

The Oil, Chemical, and Colour Trades Exhibition, held at the Royal Agricultural Hall from June 11 to 18, was one of considerable interest to food manufacturers. Besides various types of crushing and mixing machines, as, for example, those exhibited by J. Harrison Carter, Ltd., of Dunstable, and W. Gardner and Sons (Gloucester), Ltd., there was a good display of bottling machinery. Amongst the latter were the various ingenious machines devised by Mr. Roberts, of Bolton, who was kept very busy demonstrating to interested spectators. The *Chemical Engineering* and *Chemical Catalogue*, and copies of FOOD MANUFACTURE, as well as a collection of general advertising, technical, and engineering sketches were displayed by Messrs. Leonard Hill, Ltd.

The British Beet Sugar Industry

By A. J. V. UNDERWOOD, M.Sc., A.M.I.Chem.E.

About fifty beet sugar factories would be required to produce but a quarter of the sugar consumed in this country. At present fourteen factories are in operation. With the fate of this new industry still undecided, a review of its present position and a discussion of the conditions essential to its success will be read with considerable interest.

THE ESTABLISHMENT of a successful beet sugar industry in Great Britain depends on the answers to two important questions: Do the climatic and other conditions permit of the successful cultivation of the sugar beet? Can the process of manufacture be carried on at a profit when the price paid for the beet is sufficient to allow the farmer a satisfactory margin of profit? Experience has clearly shown that the sugar beet can be cultivated successfully in this country, and the first question has been definitely answered in the affirmative. In fact, it has been found that the English climate is in many respects particularly favourable for this crop.

A definite answer to the second question cannot as yet be given, because it is impossible to forecast the future price of sugar and the position which will follow the termination of the present subsidy. There are, however, reasonable grounds for hoping that the industry can be established as a permanent and important factor in the agricultural and industrial economy of the country, though there are still many difficulties to be overcome and strenuous efforts will have to be made if it is to carry on without State assistance.

History

A brief summary of the events which led up to the British Sugar (Subsidy) Act, 1925, is useful in understanding the present position. As the operations of the Cantley factory (opened in 1912) and the Kelham factory (opened in 1921) were attended with serious financial loss, the Government decided in 1922 to remit the Excise Duty on home-grown sugar in order to facilitate the establishment of the industry. The value of this assistance was obviously dependent on the maintenance of a high Customs Duty on imported sugar (since this determines the Excise Duty), and the uncertainty involved in this form of assistance, which must be affected by political considerations, did not favour the investment of capital in the industry. The reduction of the duty in the 1924 Budget showed this quite clearly, and it was then decided to lay down definitely the amount of assistance to be given by the State. The Excise Duty was reimposed (less the preference given to home and Empire grown sugar) and a direct subsidy was granted, payable on the amount of sugar produced. The subsidy is for a period of ten years, and amounts to 19s. 6d. per cwt. for the four years beginning with 1924, then falls to 13s. per cwt. for the next three years, and finally to 6s. 6d. for the last three years. As a condition of the subsidy, the factory is at present required to pay the farmer a minimum price of 54s. per ton of beet with a sugar content of 15·5 per cent., with an addition of 2s. 6d. per ton for each per cent. of sugar above this amount. In addition, 75 per cent. of the machinery of the factory must be of British manufacture.

The growth of the industry under the stimulus of the subsidy is amply demonstrated by the following figures:

Campaign.	*Acreage under Sugar Beet.*	*Beets Worked.*	*Sugar Produced.*	*Molasses Produced.*
	Acres.	Tons.	Tons.	Tons.
1924-5	22,637	183,713	23,915	5,701
1925-6	56,243	431,185	51,784	13,545
1926-7	129,463	1,098,705	142,642	13,256
1927-8	about 200,000 (estimated)			

While only three factories—Cantley, Kelham, and Colwick—were built before the passing of the Subsidy Act, the number of factories in operation during the 1926-1927 campaign was fourteen, and four new factories are to be erected this year to be ready in time for the 1927-1928 campaign. The capital invested in these factories will amount to about 7½ million pounds.

Conditions for Success

Without entering on a general discussion of the merits of subsidies to industry, it must be remarked that in no country has it been found possible to establish a beet sugar industry without substantial Government assistance. For this reason it is instructive to examine the various factors which render a subsidy essential, since the operation of these elements is intimately connected with the possibility of establishing a permanent industry on an independent basis.

It is a first essential that the factory should have an adequate supply of the raw material—the beets—and this can only be obtained if the farmer is prepared to grow it. The conservatism—characteristic of the farmer all the world over—naturally opposes the introduction of a new crop unless it can be clearly shown to be highly profitable. The cost to the farmer of growing a new crop must obviously be high until he has had experience of the cultivation. In order to induce the farmer to grow the new crop, the price

paid must cover this high cost and still allow a substantial profit. Such a price is necessarily above the economic price, and can only be paid with external assistance.

The capital required to establish factories, which cost about £300,000 each to construct, can only be attracted to a new industry if there is a reasonable assurance of profitable investment. As was expected, the first factories to be built experienced some difficulty in obtaining an adequate supply of beet in spite of the attractive price offered. As the overhead charges of a sugar factory are high, since the average working season is only 100 days, any reduction in output due to an insufficiency of beet means a considerable increase in cost of manufacture. Only with a State subsidy can a profit be secured in face of these high costs. Other causes also lead to high manufacturing costs in the first stages. Workmen and technical staff must be trained to the special processes of the industry if high efficiency is to be attained. Even if an experienced technical staff is imported from abroad, as has been done with most factories, it must adapt itself to local conditions here, since mere mechanical application of experience in other countries will not necessarily give the best results in this country. The limited period of the subsidy has in some cases resulted in factories being built hurriedly, with the consequence that the initial cost has been high and the efficiency not of the best.

Economies

The economies which are essential to the establishment of the industry on a self-supporting basis must be sought along two main lines. In the first place, the cost of production to the farmer must be reduced; and in the second place, the cost of manufacture must be reduced. The main endeavour of the farmer must be to increase the yield per acre. While the average yield on the Continent may be taken as somewhere about 12-13 tons per acre, the yield in this country was only 8·7 tons per acre last year. This, however, marks an increase over the figure for 1925—namely, 7·67 tons per acre, though it is possible that some of this improvement is due to better weather conditions, since the yield for 1924 was 8·2 tons per acre. The experience of individual farms has shown that there should be no real obstacle to obtaining yields as high as those attained on the Continent if proper methods of cultivation are utilised. Careful attention to singling, hoeing, and fertilising will give vastly improved yields, and, although this generally increases the cost per acre, it is almost invariably found that the yield is increased to such an extent that the cost per ton of beet is substantially reduced. Improved methods of working will also assist in raising the sugar content, though there is not so much room for improvement in this direction as in the yield, since the average sugar content for Great Britain for the years 1924, 1925, 1926 was 16·65 per cent., 16·36 per cent., and 17·0 per cent. respectively. A higher sugar content not only increases the price received by the farmer, but also reduces the cost of manufacture in the factory on account of the greater purity of the juice. The transport costs of the farmer are at present an appreciable item. As the areas in which beet is now grown become more intensively cultivated, and as the number of factories increases, the distance of the farmer from the nearest factory will decrease, and consequently his transport cost will be less. Better cleaning of the beets will also reduce this charge, because the freight which is paid on the dirt sent with improperly cleaned beets sometimes amounts to an appreciable sum.

The reduction of manufacturing costs in the factory can only be attained by increased efficiency in working. The experience of the staff and management will undoubtedly conduce to material economies. It is also essential that a wise and conservative financial policy be adopted to allow of adequate allowances for depreciation and reduction of capital out of the profits made during the subsidy years.

Utilisation of By-products

A further important factor in the success of the industry is the utilisation of the by-products, and this depends largely on the farmer. The feeding value of the beet tops and of the dried pulp or slices from which the sugar has been extracted must be realised. At present the anomalous position exists that most of the dried pulp is shipped from England to America, while we import large quantities of other feeding stuffs, a position which results entirely from the small demand for it in this country. With further experience it may be expected that a demand for this product will be created. The farmer must also appreciate that the value of his crop is not expressed entirely by the price received for the beet, but includes in addition the value of the tops for feeding and the residual manurial value of the beet crop in increasing the yield of the cereal crop which follows it.

New Processes

An interesting possibility of ensuring the prosperity of the beet sugar industry lies in the De Vecchis process, which is under investigation and development by the Institute of Agricultural Engineering. This process consists of drying the beet slices so that they can be stored for a considerable time without deterioration, thus enabling the sugar factory to work for the whole year and reduce its overhead charges considerably. The possibility has also been envisaged of small drying plants to be established on the farm with the object of achieving an important saving on the carriage to the factory. There are many technical difficulties to be overcome, and it is as yet too early to say whether this process will be commercially applicable, though satisfactory results are claimed for the preliminary experimental work.

The Outlook

Although there will be eighteen factories completed by the end of this year, the number is still small in comparison with the sugar consumption of the country, since it is estimated that about fifty

(*Continued on page* 75.)

Census of Production (1924)

The following particulars, extracted from the Board of Trade Journal, are given by the Third Census of Production (1924). Preliminary Reports Nos. 13, 14 and 15.

Vinegar, Aerated Waters, Cider, British Wine, etc.

The following table gives the outputs for 1924 and 1907, so far as can be ascertained:

Products.	1924. Quantity.	1924. Selling Value.	1907. Quantity.	1907. Selling Value.
	Gallons.	£	Doz. Bottles.	£
Table Waters ..	36,004,000	4,848,000	94,054,000	4,046,000
			Gallons.	
Cider and Perry ..	8,653,000	667,000	2,663,000	151,000
Wine, British made	1,742,000	399,000	817,000	108,000
Vinegar and Acetic Acid	14,613,000	979,000	14,763,000	422 000
Lime and Lemon Juice	531,000	151,000	1,794,000	203,000
Other Fruit Juices	96,000	41,000		
Non-Alcoholic Drinks, Brewed (*e.g.*, Ginger Beer, Herb Beer, etc.)	—	392,000	—	221,000

The output of table waters for 1924 has considerably declined compared with that of 1907. There is a big drop in the production of fruit juices. On the other hand, the output of cider and perry in 1924 is more than three times that for 1907; also the output of British wine has more than doubled.

Gelatine, Animal Fat, Starch, Dextrine, Farina, etc.

Products.	1924. Quantity.	1924. Selling Value.	1907. Quantity.	1907. Selling Value.
	Cwts	£	Cwts.	£
Starch	461,100	903,000		
Dextrine and Farina and Potato Flour ..	39,000	56,000	(Not separately recorded)	
Other Farinaceous Products (including Mustard)	457,000	1,717,000		
Total Farinaceous Products ..	957,100	2,676,000	1,250,000	1,658,000
Glue and Size ..	513,000	812,000	645,000	573,000
Gelatine	34,000	201,000		
Animal Fat, not refined:	Tons.		Tons.	
Tallow	6,000	201,000	18,000	460,000
Other Sorts ..	19,000	650,000		

The quantity of glue, size, and gelatine recorded in 1924 was less by about 15 per cent. than in 1907, and a decline is also indicated in that of bones and bone by-products.

In addition to the output of 1,250,000 cwts. of farinaceous products made and returned on this Schedule in 1907 there were returned on Schedules for other trades 566,000 cwts. of similar products valued at £398,000, and there is little doubt that a similar large addition will have to be made in respect of 1924. A further output of prepared foods for infants and invalids was recorded in 1907 as returned by manufacturers making Returns on other Schedules, the value being £626,000, and the output of such foods in 1924 will have to be brought under review at a later stage.

Exports of rice starch and other kinds of starch in 1924 amounted to 28,900 cwts., valued at £67,000, and of dextrine and farina and potato flour to 9,800 cwts., valued at £18,000, the quantities exported forming about 6 per cent. and 25 per cent. respectively of the amounts shown as produced during the year. Net imports of rice and other starch in 1924 were 2,005,600 cwts., valued at £1,683,000, and of dextrine and farina and potato flour 798,100 cwts., valued at £737,000.

Bacon-curing and Sausage Trades

The statement below gives details of the output during the years 1924, 1912, and 1907 of factories and workshops engaged in the curing of bacon and hams and the manufacture of lard, sausages, and kindred products for the wholesale trade. The statement is confined to output in Great Britain.

Pork butchers and grocers making sausages, brawn, etc., or curing bacon solely for their own retail trade were not required to furnish Returns to the Census Office. The particulars appearing in the table are believed to represent the bulk of the output of bacon and hams in Great Britain in the year 1924. In the case of preserved and cooked meats, however, the amounts now shown represent only a relatively small part of the total quantity made, the majority of firms engaged in the manufacture of those goods having furnished Returns on Schedules specially relating to preserved meats and kindred products. It is also probable that a considerable quantity of lard was made by firms whose main output was returned on the Schedule for the Butter and Cheese Trades.

The figures shown for each year in respect of bacon and hams are inclusive of bacon and hams purchased in a partly cured state and merely smoked by the purchasing firm. So far as such goods were imported partly cured there is no duplication, but in cases where the goods were purchased from bacon curers in Great Britain their quantity and value is duplicated in the aggregates shown above. The

Products.	1924. Quantity.	1924. Selling Value.	1912. Quantity.	1912. Selling Value.	1907. Quantity.	1907. Selling Value.
	Cwts.	£	Cwts.	£	Cwts.	£
Bacon	1,409,000	8,822,000	832,000	3,219,000	805,000	2,633,000
Hams	312,000	2,057,000	291,000	1,152,000	359,000	1,274,000
Bacon and Hams not separately distinguished ..	289,000	1,711,000	—	—	—	—
Total — Bacon and Hams..	2,010,000	12,590,000	1,123,000	4,371,000	1,164,000	3,907,000
Pork, Salted (other than Bacon and Hams) ..	10,000	114,000	25,000	85,000	10,000	23,000
Lard	422,000	1,770,000	361,000	1,026,000	[illegible]	1,208,000
Bladders, Casings and Sausage Skins ..		737,000	—	298,000	—	[illegible]
Prawn, etc.		[illegible]	—	360,000	—	[illegible]
Other Preserved and Cooked Meats and Pies		[illegible]				
Sausages		3,074,000	—	913,000		711,000
Heads..		84,000	—	72,000	—	[illegible]
Dripping and other Fats ..		396,000	—	98,000		
Bones		47,000	—	[illegible]		
Other Offals and By-products		[illegible]				175,000
Tripe, Dressed		[illegible]	..	243,000		
All other Products and work done		638,000				
Total Value ..		[illegible]	—	[illegible]	—	6,735,000

extent of such duplication cannot be determined from the information recorded on the Census Schedules, and the extent of the corresponding duplication in the Returns for 1907 and 1912 is also unknown. The relation of the quantities of bacon and hams produced in the three years cannot, accordingly, be determined with precision. Of the total quantity recorded for 1924 (2,010,000 cwts.) the amount which is known to consist of bacon and hams which were only smoked by the firms in whose Returns they were included was 695,000 cwts., and a further amount may have to be added on this account.

Firms who made their Returns on Schedules for the Bacon Curing and Sausage Trades were asked to make a voluntary statement of the number and approximate weight of the pigs killed by them or bought ready-killed for the purpose of producing their output of bacon, sausages, etc., in the year 1924. This information was given by firms whose total output was valued at £10,195,000, or about 45 per cent. of the total output for the trade as a whole, and the particulars are as follows:

	No	Approximate Weight.
Pigs killed in year—		
Of firms' own rearing	4,418	325 tons
Purchased	925,785	56,486 tons
Killed pigs purchased in year	155,184	12,327 tons

The firms that furnished this information stated in their Returns that they cured 863,740 cwts. of bacon and hams (valued at £5,413,000) and made 85,630 cwts. of lard (valued at £397,000), besides sausages valued at £2,239,000 and preserved meats, brawn, dripping, offal, etc., valued at £2,146,000. It appears to be not improbable that some of those firms bought pork for the purposes of the minor branches of their business as well as pigs for bacon-curing. Included in the foregoing figures are 90,427 pigs weighing 10,072 tons, killed or bought by firms that did not cure bacon but only made sausages.

It will be noted that the total value of the output of this trade in the year 1924 is about three times that recorded for the pre-war years. Even after taking account of the advance in prices, the increase in aggregate value indicates a very substantial increase in the volume of production, the increase being due mainly to expanded production on a wholesale scale of bacon and hams, sausages and preserved and cooked meats.

Exports and Imports

The quantity and value of bacon and hams of British production exported in the year 1924 were 45,000 cwts. and £293,000 respectively, and net imports amounted to 8,924,000 cwts., valued at £42,618,000.

The exports of lard in 1924 amounted to 10,000 cwts., valued at £45,000, and the net imports to 2,475,000 cwts., valued at £8,717,000. In addition, 44,000 cwts. of imitation lard, valued at £129,000, were exported, and 80,000 cwts., valued at £247,000, were imported for consumption in the United Kingdom.

Net Output

The net output of the factories and workshops covered by the foregoing statement was £4,420,000 in the year 1924, that sum representing the amount by which the total value of the output (£22,774,000) exceeded the cost of materials purchased and used (£18,354,000). The net output per head of persons employed in 1924 was £337, in 1912 £178, and in 1907 £163.

Persons Employed

The average number of persons employed during the year 1924 at the factories and workshops to which the foregoing statement of output relates was 13,106, of whom 10,551 were returned as operatives and 2,555 as management, clerical, and technical staff. In the year 1907 the number of persons employed was returned as 5,160, of whom 4,396 were wage-earners and 764 were salaried persons.

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Book Reviews

The Chemical Analysis of Foods. H. E. Cox, M.Sc., Ph.D. (Lond.), F.I.C. Pp. 323, with 38 illustrations. London: J. and A. Churchill. 1926. 18s. nett.

This is a practical treatise on the examination of foodstuffs and the detection of adulterants, written by an analytical and consulting chemist. The methods given are, with only few exceptions, those which have been well tried and found reliable. Although it is stated that the point of view is rather that of the requirements of public health and of the Sale of Foods and Drugs Acts than of the food industry chemist, yet the latter will find it a useful volume.

The matter is well arranged, and the directions for analytical procedure are clearly and concisely presented. The value of the work is considerably enhanced by copious references to literature. In addition to methods of analysis, much information of a general character on the various products is given.

The materials treated include sugars, syrup, treacle, honey, jam, marmalade, starches, cereals, bread, custard and blancmange powders, baking powders, egg products, vegetables, fruits and fruit products, tea, coffee, cocoa, chocolate, cocoa-butter, condiments, wines and spirits, meat and meat products, gelatine, milk, dried milk, infant foods, butter, margarine, cheese, lard, suets, and various oils.

The Bacteriology of Food. C. E. Dukes, O.B.E., M.Sc., M.D., D.P.H. Pp. 180. Illustrations, 25. Demy 8vo. London: H. K. Lewis and Co., Ltd. 1925. 7s. 6d.

This book has been written by a bacteriologist and pathologist from the hygienic, medical, agricultural, and industrial points of view. The author has performed a useful service in the interests of the food manufacturer. There is no doubt, as the author states, that in the past students of public health have been instructed in the bacteriology of infectious disease only, but it is now realised that they must have a wider outlook than one which merely includes pathogenic germs. Furthermore, medical bacteriologists are usually lamentably ignorant of the significance of all but pathogenic germs.

The book opens with a chapter on food preservation, which is followed by one dealing with the methods of the bacteriological examination of water. Nearly half its pages are devoted to milk, evaporated milk, and fermented milk. There are three short chapters on canned foods, preservation of food by cold, and fermented foods, which provide interesting reading.

The author has an attractive style, so that, despite its somewhat forbidding title, much of the book can be read without undue effort by those not possessing special knowledge. Certainly it should be read by every student of public health.

Books Received

Hygienic Fundamentals of Food Handling. C. Thorn and A. C. Hunter. Pp. 228. London: Baillière, Tindall and Cox. 1924. 13s. 6d.

Guide to Acts and Regulations Affecting the Retail Meat Trade. W. G. T. Blois. Pp. 28. London: Meat Traders' Journal Co., Ltd. 1927. 4d.

The Fishing Industry. W. E. Gibbs. Pp. 132. London: Sir Isaac Pitman and Sons, Ltd. 1922. 3s.

Food Wisdom. D. D. Cottington Taylor. Pp. 136. London: Sir Isaac Pitman and Sons, Ltd. 1926. 2s. 6d.

Vinegar: Its Manufacture and Examination. Second Edition. C. A. Mitchell. Pp. 211. London: Charles Griffin and Co., Ltd. 1926.

Fruit and the Fruit Trade. F. Fairford. Pp. 151. London: Sir Isaac Pitman and Sons, Ltd. 1926.

Home Preservation of Fruit and Vegetables. M. J. Watson. Pp. 142. London: Oxford University Press. 6s.

The Manufacture of Confectionery. R. Whymper Pp. 251. London: St. Catherine Press. 1923.

Cocoa and Chocolate: Their Chemistry and Manufacture. Second Edition. R. Whymper. Pp. 568 London: J. and A. Churchill.

Directory of Paper Makers for 1927. Pp. 268. London: Marchant Singer and Co. 5s.

The Yearbook of the Universities of the Empire Edited by W. H. Dawson and published for the Universities Bureau of the British Empire. Pp. 858. London: G. Bell and Sons, Ltd. 1927 7s. 6d.

Trade Publications

Chiswick Chemical Works.—An illustrated booklet giving an account of the chemical works at Chiswick Mall for the manufacture of essential oils and synthetics, and of a plant in Mysore for the distillation of sandalwood oil.—The Chiswick Chemical Works, Church Wharf, Chiswick Mall, London, W.4.

Colours for the Meat Trade, Fish Curers, and Confectionery.—Three folders giving particulars of colours for polony skins, sausages, black puddings, sauces, potted meats, cakes, biscuits, custard powders, sweets, chocolates, jellies, jam, mineral waters, kippers, fillets, and numbers of other products turned out by the food industry. Those responsible for these folders are deserving of the warmest praise for the way in which they have been compiled and illustrated. The useful information is admirably presented and the coloured illustrations are extremely attractive. — British Dyestuffs Corporation, Ltd., Hexagon House, Blackley, Manchester.

Commercial and Legal News

(The Editor does not accept responsibility for any errors which may occur in the following notices.)

New Companies

The undermentioned particulars of New Companies recently registered are taken from the Daily Register compiled by Jordan and Sons, Ltd., Company Registration Agents, 116-118, Chancery Lane, London, W.C.2.

UNITED CATERERS, LIMITED. (222073) Registered May 24, 1927. 4, Union Court, Old Broad Street, E.C. Public company. To enter into an agreement with Broad Street Investments, Limited; and to carry on bus. as bakers, millers, confectioners, wine, beer, and spirit mchts., etc. Nom. cap.: £350,000 in 150,000 preference shs. of £1 and 400,000 ordinary shs. of 10s. Minimum subsn.: 7 shares.

Dirs.: G. Rentoul, M.P., 2, Harcourt Bldgs., Temple, E.C.4.
F. Barker, J.P., 66, Howards Lane, Putney, S.W.15.
Sir William Kay, J.P., "Northcliffe," Norbreck, Blackpool, Lancs.
Sir Frank C. Meyer, Bt., M.P., 18, Lowndes St., S.W.1.

Qual. of dirs., £500.

OCEAN PRESERVING CO., LIMITED. (222515) Regd. June 13, 1927. Epicure Works, Athol Street, Poplar, E.14. To carry on the bus. of mnfrs. of and dlrs. in pickles, sauces, and meat extracts, etc. Nom. cap.: £2,000 in £1 shs.

Permt. gov. dir.: I. Silver, 3, Rondu Rd., Cricklewood, N.W.2.

CHANTILLY CHOCOLATES, LIMITED. (222111) Regd. May 26, 1927. 3 and 5, Latona Road, S.E.15. To carry on the bus. of mnfrs. of cholocate and other confectionery articles, etc. Nom. cap.: £2,000 in £1 shs.

Dirs.: C. Knight, 7, Hayes Road, Beckenham (permt. chairman).
F. S. Tuckett, The Hall, Blackheath Park, S.E.3.

Qual. of dirs., one share.

J. MARTIN AND COMPANY (AERATED WATERS), LIMITED. (222118) Regd. May 26, 1927. 44, Caves Road, St. Leonards-on-Sea, Sussex. To take over the bus. of a mineral water mnfr. and firewood dlr. now cd. on at St. Leonards-on-Sea, as "J. Martin and Co." Nom. cap.: £5,000 in £1 shs.

Permt. dirs: E. H. Perks, 2, Down Street, Piccadilly, W.
T. B. Miller, 187, Piccadilly, W.

Qual. of dirs., £50 shs.

EDEN VALE DAIRIES, LIMITED. (222081) Regd. May 25, 1927. To take over the bus. of a wholesale and retail dlr. in milk and dairy produce cd. on at Nith Place, Dumfries, and elsewhere, as the "Eden Vale Dairy." Nom. cap.: £4,000 in £1 shs. (2,950 pref. and 1,050 ord.).

Dirs.: W. J. Wright, "Nithside," Dumfries (chairman and permt. mang. dir.).
E. N. Gibson, "Inglewood," Dumfries.

Qual of dirs., 250 shs. (not less than 50 shs. to be ord.). Remun. of dirs., as voted by the co.

ATTY'S (1927), LIMITED. (221936) Registered May 19, 1927. Selborne Road, Blackpool. To take over the bus. of confectioners and sweet mnfrs., etc., cd. on at Blackpool, by C. G. Nickson, E. C. Page, F. Ayre, and L. Ingham. Nom. cap.: £3,000 in £1 shs.

Dirs.: C. G. Nickson, "Strathdene," Derby Rd., Poulton-le-Fylde.
E. C. Page, "Marcovil," Leamington Road, Blackpool.
F. Ayre, 30, Brick Road, Blackpool.
L. Ingham, "Eve-Lyne," Richmond Place, Blackpool.

Qual. of dirs., £250. Remun. of dirs., £50 each per. annum.

GOLDEN DAWN YEAST COMPANY (NORTHERN), LIMITED. (222386) Regd. June 8, 1927. To enter into an agreement with the Golden Dawn Yeast Co., with the object of acquiring all rights in certain defined territory shortly described as the Northern part of Great Britain in relation to the use of the name "Golden Dawn" in connection with yeast, etc. Nom. cap.: £1,000 in £1 shs.

Dirs., to be appointed by the subs.

Subs.: A. Parker, 5, Holborn, E.C.1 (cashier).
A. H. Freeman, 5, do. (secretary).

BRITISH SUGAR DEVELOPMENTS, LIMITED. (222376) Regd. June 8, 1927. To carry on the bus. of sugar refiners and mnfrs., etc. Nom. cap.: £5,000 in £1 shs.

Dirs., not named. Qual. of dirs., 5 shs.

Subs.: G. Boggis, 7, Hornsey Lane Gardens, Highgate, N.6.
Jessie M. Thorpe, 126, Salisbury Road, N.W.6 (clk.).

GELATINE MANUFACTURING COMPANY, LIMITED. (222322) Regd. June 3, 1927. Atlantic House, 46, Holborn Viaduct, E.C.1. To carry on the bus. of mnfrs. of and dlrs. in gelatine and gelatine sheets, etc. Nom. cap.: £1,000 in £1 shs.

Permt. dir. and ch.: R. de Kat, 8, Drayton Court, S.W.10.

Qual. of permt. dir. and ch.: the holding of fifty-five per cent. of the issued shares. Remun. of dirs., as voted by the co.

BARNES CAFÉ, LIMITED. (222188) Registered May 30, 1927. To take over the bus. of bakers, confectioners, and café proprs., etc., cd. on at Worthing, as "Barnes, Worthing." Nom. cap.: £10,000 in £1 shs. (2,500 preference and 7,500 ord.).

Permt. dirs.: W. E. Green, "The Croft," Cissbury Road, Broadwater, Worthing.
R. H. Jenner, 49, Stafford Road, Brighton.

Qual. of dirs., £500.

W. DICKINSON AND SON, LIMITED. (222226) Regd. May 30, 1927. To carry on the bus. of sugar boilers and chocolate makers, etc. Nom. cap.: £100 in £1 shs.

Dirs.: W. Dickinson, 46, Spencer Street, Barnsley.
N. Dickinson, 26, Holgate Avenue, Barnsley.
Qual. of dirs., 10 shs.

PURE ICES (NORWICH), LIMITED. (222149) Regd. May 27, 1927. To carry on the bus. of ice cream mnfrs. and dairymen, etc., at Trafalgar Street, Norwich, or elsewhere. Nom. cap.: £1,000 in £1 shs.

Dirs.: S. Spurgeon, 81, St. Giles St., Norwich (permt. mang. dir.).
Miss F. E. Spurgeon, 81, do.
Qual. of dirs., £100. Remun. of dirs., as voted by the co.

BEERS TOFFEES (ULVERSTON), LIMITED. (222160) Regd. May 28, 1927. To carry on the bus. indicated by the title. Nom. cap.: £1,000 in £1 shs. (400 founders' and 600 ord. "B").

Dirs.: J. E. Coward, 25, Ainslie Street, Ulverston.
W. Dent, 45, Sunderland Terrace, Ulverston.
W. E. Baker, "Brierlea," Park Road, Ulverston.
Mrs. C. Taylor, 10, Clarence Street, Ulverston.

London Gazette Information

Board of Trade Orders.

The Board of Trade, under the powers conferred by Sub-Section (2) of Section 15 of the Sale of Food (Weights and Measures) Acts, 1926 (16 and 17 Geo. 5., ch. 63), hereby order as follows:

1. The date on which the provisions of the said Act so far as they relate to pre-packed articles other than tea shall take effect shall be January 1, 1928.

2. This Order may be cited as the Sale of Food (Pre-packed Articles) Order, 1927.

In exercise of the powers conferred upon them by the Ministry of Food (Continuance) Act, 1920, the Ministry of Food (Cessation) Order, 1921, the Expiring Laws Continuance Act, 1926, and of all other powers enabling them in that behalf the Board of Trade hereby order as follows:

1. Part I of the Sale of Food Order, 1921 (S.R. and O., 1921, No. 1305), as amended by the Order dated December 14, 1921 (S.R. and O., 1921, No. 1883), made by the Board of Trade is hereby revoked but without prejudice to any proceedings in respect of any contravention thereof.

2. This Order may be cited as the Sale of Food (Revocation) Order, 1927, and shall come into operation on July 1, 1927.

Board of Trade Regulations.

Sale of Food (Weights and Measures: Pre-packed Articles) Regulations, 1927, dated June 14, 1927. Copies of these Rules may be purchased (Price 1d.) direct from His Majesty's Stationery Office.

Winding-Up Petition.

RUMPELMAYER, LTD. A petition for the winding-up of this company by the High Court was on June 10, 1927, presented to the Court by W. H. Cullen (a firm), 32-38, Earl St., E.C.2. Hearing, June 28, at Royal Courts of Justice, Strand, W.C.

Bankruptcy Acts, Appointment of Trustee.

BURFORD, ERNEST ENOCH, described in the Receiving Order as Ernest Enoch Burford (junior), and trading as E. Burford (junior), carrying on business at Alscot Works, Kintore St., Bermondsey, S.E. Vinegar merchant. (108 of 1927) Trustee: A. H. Partridge, C.A., 3, Warwick Court, Gray's Inn, W.C. Appointment, May 21, 1927.

Companies Acts, Winding-Up Order.

CHAMPION PRODUCTS CO., LTD., Kingsbury House, King St., St. James's, London. (00213 of 1927) Order dated May 31, 1927.

(Continued from next page.)

Determination of Illipé Butter in Chocolate. H. W. Bywaters, F. T. Maggs, and C. J. Pool. (*Analyst*, June, 1927, 324.)

Determination of Milk Products in Cocao Products. H. C. Waterman and H. A. Lepper. (*Ind. Eng. Chem.*, 1927, 501, 506.)

Formation and Determination of Essential Oil of Mustard in Mustard Flour. Astric and M. Mousseron. (*Jour. Pharm. Chim.*, 1927, 313.)

Chemistry of Tea Leaves, II. H. O. Calvery. (*Jour. Biol. Chem.*, 1927, 549.)

Detection of Minute Amounts of Naphthalene in Flour. A. K. Epstein and B. R. Harris. (*Cereal Chem.*, 1926, 60.)

Rapid Method for Determining the Gasoline Colour Value of Flour and Wheat. D. A. Coleman and A. Christie. (*Cereal Chem.*, 1926, 84.)

Gasoline Colour Value of Several Classes of Wheat. D. A. Coleman and A. Christie. (*Cereal Chem.*, 1926, 188.)

Rapid Colorimetric Determination of Hydrogen-ion Concentration of Crackers. R. T. Bohn and R. J. Martz. (*Cereal Chem.*, 1926, 183.)

New Factor for Converting the Percentage of Nitrogen in Wheat into that of Protein. D. B. Jones. (*Cereal Chem.*, 1926, 194.)

Rapid Moisture Testing Oven for Cereal Chemistry Laboratories. D. A. Coleman and H. B. Dixon. (*Cereal Chem.*, 1926, 419.)

Determination of Amino Acids and Proteolytic Activity in Wheat and Flour. H. J. Denham and G. W. Blair. (*Cereal Chem.*, 1927, 58.)

Colorimetric Determination of Nitrogen in Foodstuffs. W. Golub. (*Zeit. Anal. Chem.*, 1927, 119.)

Determination of Sodium, Potassium, and Chlorine in Foodstuffs. A. D. Husband and W. Godden. (*Analyst*, 1927, 72.)

Standardisation of Malt Analysis. F. Drchacek and V. L. Zila. (*Woch. Brau.*, 1926, 455, 467.)

Examination of Raw Milk by the Small Plate Method. A. M. van den Burgh. (*Pharm. Weekblad.*, 1927, 417.)

Critical Solution Temperatures and Butter Analysis. J. Wauters. (*Bull. Soc. Chim. Belg.*, 1927, 271.)

Determination of Fat in Milk by Neusal Method. M. Popp. (*Chem. Ztg.*, 1927, 270.)

Immersion Refractometer and its Value in Milk Analysis. G. D. Elsdon and J. R. Stubbs. (*Analyst*, 1927, 193.)

Examination of Foodstuffs for Preservatives. A. C. Chapman. (*Analyst*, 1927, 215.)

Current Literature

Fruit and Vegetable Products

Efficient Tomato Canning, II. A. W. Bitting. (*Fruit Prod Jour.*, May, 1927, 14.)

Advantages of Using Vinegar in Canning Vegetables. W. G. Toplis. (*Fruit Prod. Jour.*, May, 1927, 17.)

Effect of Temperature on Amount of Storage Losses with Tomatoes. J. H. MacGillivray. (*Canner*, April 2, 1927.)

Methods of Canning Figs in California. W. V. Cruess. (*Canner*, March 12, 1927.)

Cold Storage of Canned Fruits. E. F. Kohman. (*Ice and Refrigeration*, June, 1927, 512.)

State and National Experimental Investigations Relating to Refrigeration. L. A. Hawkins. (*Ice and Refrigeration*, June, 1927, 526.)

The Pasteurisation of Fruit Juices. E. Jacobsen. (*Kons. Zeit.*, 1927, 24, 4.)

Preservation of Asparagus. Biene. (*Kons. Zeit.*, 1927, 22, 4.)

Meat and Fish Products

The Bacteriology of Certain Sea Fish. F. C. Harrison, H. M. Perry, and P. W. Smith. (Report No. 19, National Research Council, Ottawa, 1926.)

Formaldehyde in Fish. D. B. Dill and P. B. Clark. (*Analyst*, 1927, 222.)

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Bread, Confectionery, and Chocolate

Mechanical Modifications of Dough to Bake Bread with only the Fermentation in the Pan. C. O. Swanson and E. B. Working. (*Cereal Chem.*, 1926, 65.)

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Standardising the Experimental Baking Test. M. J. Blish. (*Cereal Chem.*, 1926, 216.)

Relation of Crude Protein Content of Flour to Loaf Volume. C. H. Bailey and R. C. Sherwood. (*Cereal Chem.*, 1926, 393.)

Quality of New Zealand Wheats and Flours. L. D. Foster. (*Trans. Proc. New Zealand Inst.*, 1926, 738.)

Relation of Kernal Texture to the Physical Characteristics, Milling and Baking Qualities, and Chemical Composition of Wheat. J. H. Shollenberger and D. A. Coleman. (U.S. Dept. Agric. *Bull.*, 1926 [1420].)

Determination of Baking Value of Wheat by Measure of Specific Energy of Deformation of Dough. M. Chopin. (*Cereal Chem.*, 1927, 1.)

Effect of Concentration on Viscosity of Flour Suspensions. G. W. Blair, G. Watts, and H. J. Denham. (*Cereal Chem.*, 1927, 63.)

Composition of Flaked Maize. H. E. Woodman and I. Stewart. (*Jour. Agric. Sci.*, 1927, 60.)

Wheat and Flour Studies, IX. Density of Wheat as Influenced by Freezing, Stage of Development, and Moisture Content. P. F. Sharp. (*Cereal Chem.*, 1927, 14.)

Effect of Monocalcium Phosphate upon the Viscosity of Acidulated Flour-in-water Suspensions. L. Earlenbaugh. (*Cereal Chem.*, 1926, 102.)

Quality of Bread from Wheats supplied with Nitrogen at Different Stages of Growth. W. F. Gericke. (*Cereal Chem.*, 1927, 73.)

Wheat and Flour Studies, X. Factors Influencing the Viscosity of Flour-Water Suspensions. A. H. Johnson. (*Cereal Chem.*, 1927, 87.)

Various

American Industrial Progress through Scientific Research. E. R. Weidlein. (*Chem. and Met. Eng.*, April, 1927.)

Quantitative Studies of Vitamins A, B, and C in Green Plant Tissues other than Leaves. E. J. Quinn. (*Jour. Biol. Chem.*, 1927, 557.)

Fat-Soluble Vitamins, XXVII. Quantitative Determination of Vitamin. A. H. Steenbock and K. H. Coward. (*Jour. Biol. Chem.*, 1927, 765.)

Influence of Light and Heat on the Formation of Vitamin A in Plant Tissues. K. H. Coward. (*Jour. Biol. Chem.*, 1927, 781.)

Studies of Commercial Sauerkraut, with Special Reference to Changes in the Bacterial Flora during Fermentation at Low Temperatures. L. A. Priem, W. H. Peterson, and E. B. Fred. (*Jour. Agric. Res.*, 1927, 79.)

Increasing the Protein Content of Potato Waste. W. Ekhard. (*Zeit. Spiritusind.*, 1927, 23.)

Chemical Composition of Manioc Root. W. Ekhard. (*Zeit. Spiritusind.*, 1927, 23.)

Bacteria Causing Spoilage of Evaporated Milk. C. D. Kelly. (*Trans. Roy. Soc.*, Canada, 1926 [III], 20, V, 387.)

Production of a "Caramel" Odour and Flavour in Dairy Products by *Streptococcus lactis*, Lister. W. Sadler. (*Trans. Roy. Soc.*, Canada, 1926 [III], 20 V, 395.)

Steam Generation. D. Brownlie. (*World Power*, 1927, 262, 319.)

Hard, Soft, or Softened Water for Canning Purposes. L. F. Warrick. (*Canner*, March 19, 1927.)

State Regulation of Preserve Products. C. P. Lathrop. (*Canner*, March 12, 1927.)

Theory and Practice in Processing. C. O. Ball. (*Canner*, January 22, 1927.)

A New Temperature Regulator for Brine Tanks. G. F. Taylor. (*Ice and Refrigeration*, June, 1927, 520.)

Recent Developments in Refrigeration as Applied to Dairy Products. J. T. Bowen. (*Ice and Refrigeration*, June, 1927, 523.)

Analysis

A Short Method for the Determination of Butter Fat. C. D. Elsdon and P. Smith. (*Analyst*, June, 1927, 317.)

(*Continued on previous page.*)

Recent Patents relating to Food Manufacture and Preserving

The following abstracts are obtained from recently published copies of the "Illustrated Official Journal" (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications accepted may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

267,203. **Drying vegetables, etc., materials.** B. J. OWEN. December 7, 1925.

Crops, preserving; drying at particular temperatures and pressures. In specific examples heated air is supplied to hay at an initial temperature of from 160° to 200° F., to corn at an initial temperature of 130° to 155° F., and to root crops at an initial temperature of 200° to 240° F. For vegetable substances in general a mass of material of 3,500 to 4,500 cubic feet is treated with 9,000 to 12,000 cubic feet of heated air per minute delivered under a water gauge pressure of from 1½ to 4 inches.

267,227. **Washing, scaling, and treating fish.** J. W. STAMMERS AND G. TABOR, LTD. December 12, 1925.

267,526. **Opening tins.** L. KURPIEL. March 9, 1927.

A device for opening a tin.

267,681. **Making emulsions.** J. MCGOUGAN AND J. HUNTER. February 16, 1926.

Emulsifying apparatus, for use particularly in the emulsification of butter fats and milk.

267,766. **Presses and strainers for making soups.** L. V. SALUSSOLIA. June 16, 1926.

267,928. **Margarine.** C. HILDEBRANDT-SORENSEN. March 15, 1927 (not yet accepted).

For removing water from, and for kneading and mixing, a margarine mass.

268,093. **Milk coolers.** G. W. KEARSLEY AND F. E. TOMKINS, February 10, 1926.

Plate apparatus; a milk cooler of the type in which milk flows over tubes through which a cooling medium is passed.

268,138. **Sterilising etc. condensed or evaporated milk; testing efficiency of hollow-ware.** A. E. VIDAL (Anderson-Barngrover Manufacturing Co.), April 6, 1926.

Condensed or evaporated milk in hermetically sealed cans is sterilised, etc., by passing the cans in a continuous stream, first through a zone in which their temperature is raised to a point below that required for sterilisation, then automatically separating the leaky cans from the tight ones, introducing the stream of tight cans to a zone in which they are subjected to sterilising temperature and then passing the stream through a cooling zone at a pressure above atmospheric. This may be followed by an automatic separation of tight cans from those which have developed leaks.

268,158. **Vanillin.** J. TCHERNIAC, April 27, 1926.

In purifying vanillin, an aqueous solution of the sodium bisulphite compound is prepared and is treated either to salt out the compound or to convert it into a less soluble compound by double decomposition with another salt.

268,238. **Ice-cream freezers.** R. J. NEILSON, October 16, 1926.

268,241. **Coffee extracts.** K. VON VIETINGHOFF, October 20, 1926.

A further extract is obtained from already extracted roasted coffee by wet treatment at about 160-200° C. under a pressure of about 8-12 atmospheres. The extract may be separated by centrifuging and the solid residue obtained washed, the liquors being then combined and dried by evaporation, etc.

268,254. **Dough-moulding machines.** A. MAIRICH, November 30, 1926.

268,339. **Sifting-apparatus.** TREU-HAND-GES. BARTMANN AND CO., March 21, 1927. (Not yet accepted.)

268,790. **Fermenting; food for animals; potassium salts.** R. GOLDSCHMIDT [Firm of], March 30, 1927. (Not yet accepted.)

A process for obtaining concentrated potassium solutions from distillers' mashes consists in centrifuging the fermented residues at such a speed that the suspended matter comprising yeast cells, nitrogenic, and other compounds is separated off into a semisolid or solid mass which may be admixed with bran, linseed cake, etc., to form a fodder. The clean centrifuged liquor containing potassium salts is used again for preparing new mash and the process is repeated so long as the concentration of salts does not interfere with the normal fermentation process and the concentrated salts may be worked up into potash.

268,889. **Cheese.** M. G. J. FOUASSIER, January 11, 1926.

In making cheese that is not "cooked" or reheated before ripening the drained curds are crumpled and then submitted to the ripening process. During the ripening the crumbled curds may be turned over from time to time, and after ripening the cheese may be melted and pasteurised, or sterilised, as by maintaining it for a time at a temperature between 75° C. and 100° C. A small amount of a neutral salt of a weak acid—*e.g.*, two per cent. by weight of tartrate of soda in an aqueous solution, may be added before melting. During the subsequent treatment of the cheese, care is taken to keep it in an aseptic condition.